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WOOD®

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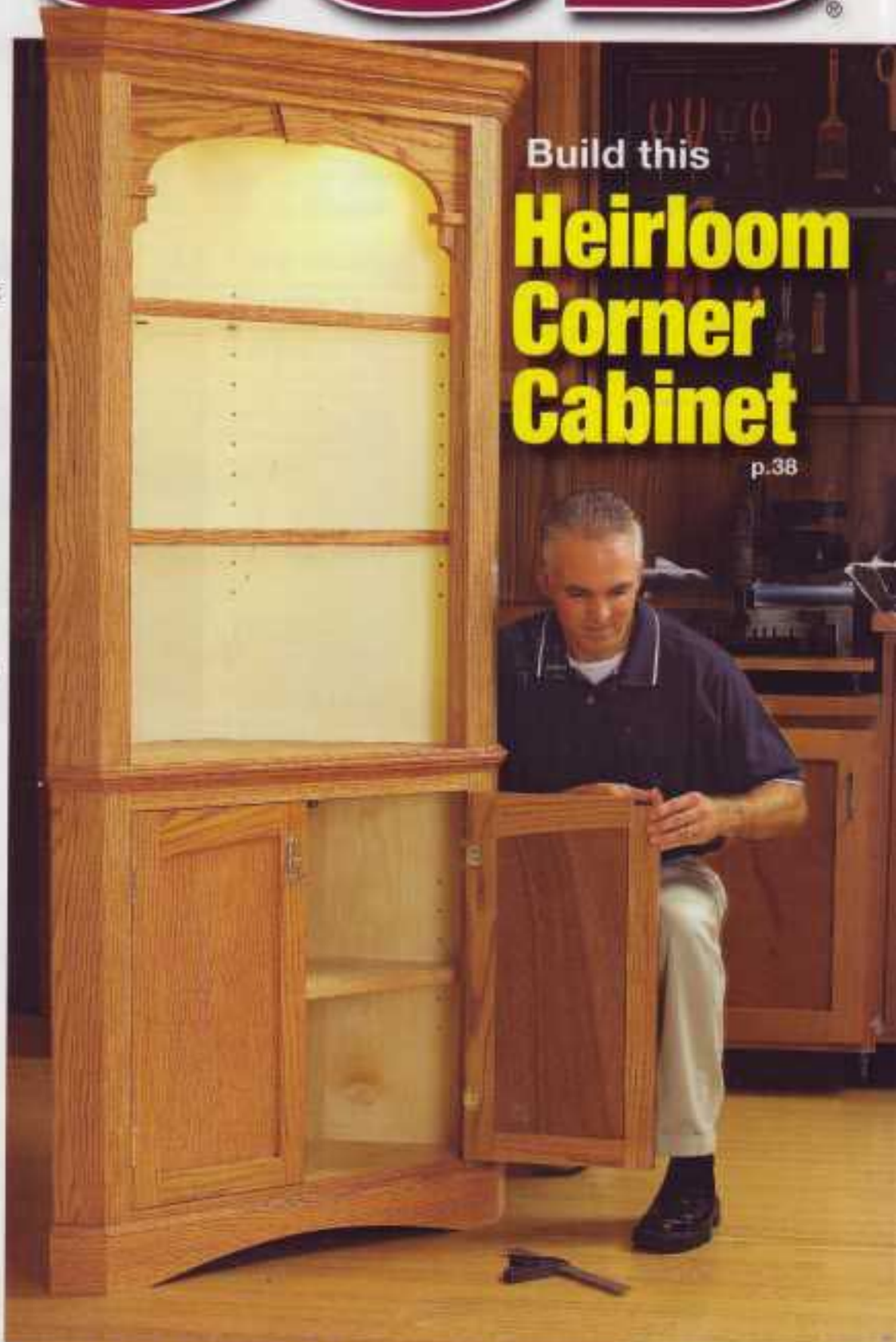

Build this

Heirloom Corner Cabinet p.38

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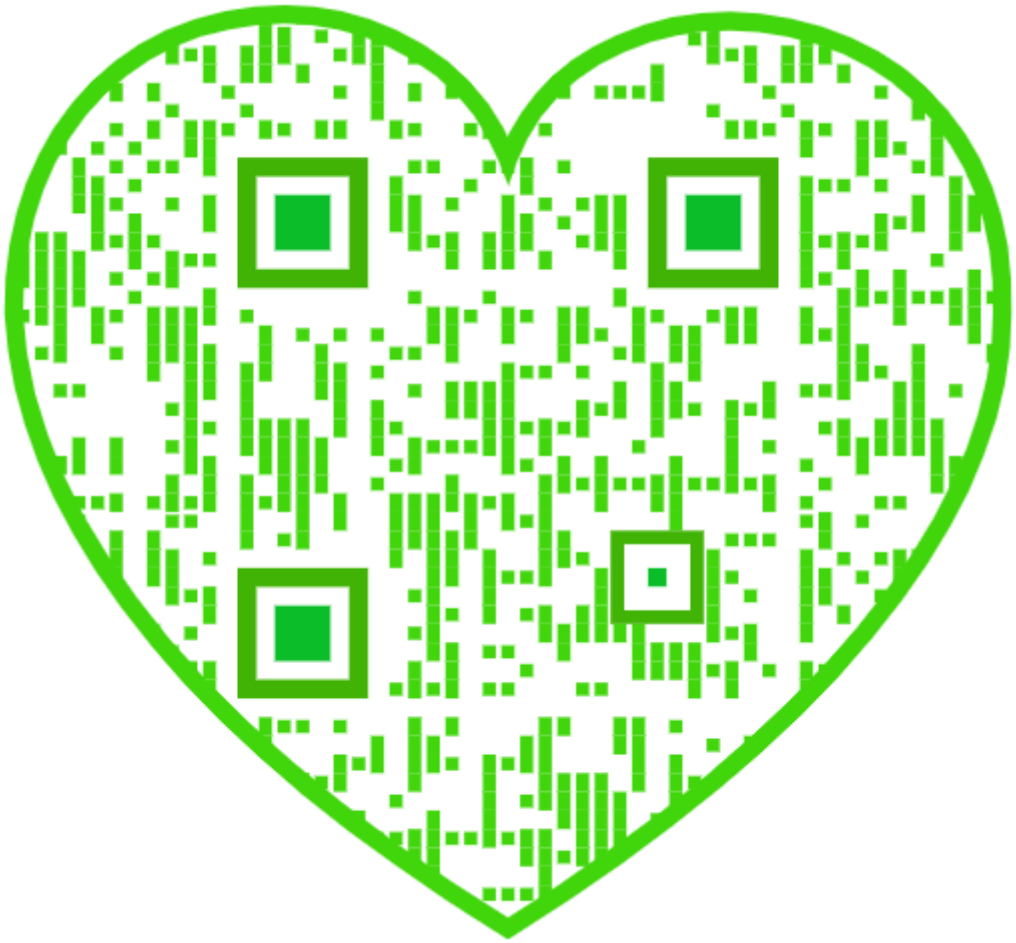

WOOD®

December/January 2006/2007, Issue 174

WOOD MAGAZINE SHOP TESTED APPROVED®

This seal is your assurance that we build every project, verify every fact, and test every reviewed tool in our workshop to guarantee your success and complete satisfaction.

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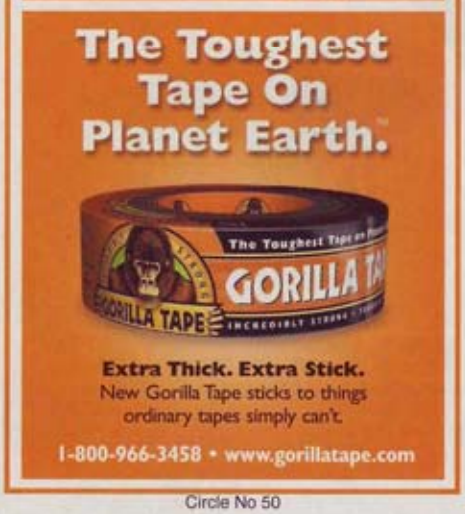
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WOOD®

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Kevin accented the cherry bookcase he made with drawers, shell-pull hardware, and bun feet.

Jeff designed and built these Greene & Greene mahogany nightstands for his home.

Jim crafted an oak liquor cabinet to match his existing dining room buffet.

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For more ways to reach us about specific matters, see *page 10.*

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editor's angle

cheaper, faster sharpening now on free video

How would you like to take your chisels from dreadfully dull to razor sharp in minutes using basic supplies and a super-simple procedure? We've developed an online video that shows you how.

When design editor Jeff Mertz recently came back from the Marc Adams School of Woodworking (where he is a regular instructor *and* student), he couldn't wait to share a new sharpening method he learned. He claimed he could take the nastiest chisel or plane iron and, in just minutes using only sandpaper, a buffing wheel, and a few other inexpensive supplies, shave his arm with it. And, he added, anyone could do the same on their first try. This I had to see. Jeff made his own improvements to the technique he learned and showed our staff how to do it over a lunch break. The results were impressive: I've never seen so many abused chisels turned into precision cutting tools so quickly.

I was so impressed, in fact, that we've produced a 6-minute video showing how to do it. You can view this freebie by simply going to our Web site: woodmagazine.com.

More free videos

We've long awaited an efficient means to provide you with helpful woodworking videos. That day has arrived. With more than half of all homes now having high-speed internet service all you need is a broadband connection to quickly and easily view videos on your computer.

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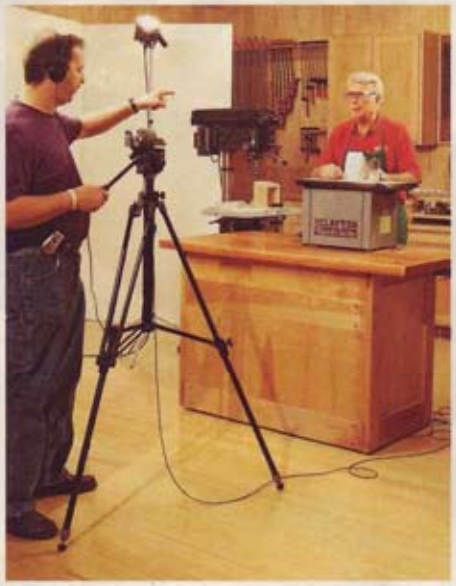
Just go to woodmagazine.com where you'll find directions to videos covering a variety of woodworking topics–many of which support articles on these printed pages. Right now you'll find free videos on the following subjects:



Editorial Manager Dave Campbell (left) and Master Craftsman Chuck Hedlund collaborate on an online video.

- Cutting curved and tapered legs like the ones on the bow-front table in issue 172.
- Wood-joint torture test in issue 173.
- How to cut and assemble crown molding. (See *page 48*.)

It's a good idea to revisit the site often as we'll be adding new videos regularly.

Free slide shows too!

Before you build a project in this magazine, check if it's accompanied by an online slide show. Here, you'll see extra photos of the project coming together in our shop. No matter your skill level, I think you'll appreciate the extra shots. This is new with this issue—right now you'll find slide shows for the corner cabinet on *page 38* and bench on *page 78*.

This icon alerts you to a free slide show.

See you on the Web.

Bill Krier

sounding board

Our bulletin board for letters, comments, and timely updates

WOOD® reader helps make *Extreme* home a reality

I recently had the privilege of working as a volunteer on a house for ABC television's *Extreme Makeover: Home Edition*. The episode, which aired on May 21, 2006, detailed the design and construction of a three-story home for the Turner family of Irvington, N.J. They had lost their previous home to fire. When the show's design producers found out that I'm a professional cabinetmaker, they gave me a lot of furniture projects to design and build because they don't get many woodworkers who volunteer; most are trim carpenters and construction workers.

During those four days, I completed the following projects: a bedroom divider for twin teen-age girls (with a bookcase on one side and bed headboard that looked like a boxing ring on the other); two bedroom side tables; a prize counter for a carnival-themed room; a cabinet to hide shutoff valves; and a shadow box made from a fireplace mantel salvaged from the old house. This shadow box displayed recovered mementos found in the ashes.

Not only did I have fun, but it was rewarding to do something for a family in need. By the time they presented the finished house to the Turner family, I'd been working for 34 hours straight—something I know I should never do when working with power tools. But it needed to be done to meet the time schedule, and I was extremely tired and a little emotional. What a heartfelt experience.

—Rick Tierno, Medford, N.J.

New Jersey cabinetmaker Rick Tierno, left, shares a moment with *Extreme Makeover: Home Edition*'s Paul DiMeo.

Rick designed and built this side table and bookcase room divider for the Turner family's new home.

Photos: courtesy of Rick Tierno

Reader adds clamping versatility to angle brace

I really liked your right angle clamping brace (woodmagazine.com/brace) shown in the assembly for the storage bench and wall shelf on page 55 of issue 170 (June/July 2006). It works great, and what a fantastic way to save money rather than buying commercial braces. I made my own, but changed the design a little so I can get more clamps on it, as shown at *right*. Thanks for the idea.

—John Goniea, Hartland, Mich.

Photo: courtesy of John Goniea

Thanks for caring about the loss of my husband

My husband had a number of hobbies and enjoyed magazines relating to all of them. When he died from complications of open-heart surgery at the age of 54, I had many subscriptions to cancel. The refund that came from *WOOD* magazine was the only one that offered condolences. Thank you for your thoughtfulness.

—Mrs. Michael P. Hudeck, Mattawan, Mich.

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ask wood

Answers to your questions from letters, e-mails, and WOOD Online®

Got a question?

If you're looking for an answer to a woodworking question, write to **ASK WOOD, 1716 Locust St., LS-221, Des Moines, IA 50309-3023**, or send us an e-mail at **askwood@woodmagazine.com**. For immediate feedback from your fellow woodworkers, post your questions on one of our woodworking forums at **woodmagazine.com/forums**.

Turn dust from nuisance to nutrient

Q: What can I do with oak, cherry, maple, and poplar chips from my dust collector? Can I use them as flower garden bedding material or mulch? I think this would be great on flower beds, as it would decompose quickly and add nutrients to the soil, but I'm not sure.

—Jim Shipman, Boonville, Ind.

A: We ran the idea by *Garden Ideas and Outdoor Living* editor Luke Miller, who didn't recommend sawdust as a bedding material, Jim. Instead of adding nutrients, the fungi and soil bacteria that break down the sawdust extract nitrogen from the soil that your plants need to thrive, sometimes turning them yellow.

Instead of using sawdust straight from the collector, create a compost pile where the wood chips can be mixed with grass clippings and other yard waste. That allows the sawdust to break down and turn into mulch, rich with the nutrients and microbes plants need.

The wood species you mention will convert to compost, but avoid sawdust from walnut, hickory, and Ailanthus (such as Chinese sumac), as well as any pressure-treated lumber, MDF, and particleboard. These contain natural or synthetic chemicals that impede plant growth.

Choose a humidity-fighting finish for bathrooms

Q: What finish would best protect the front and sides of a bathroom vanity and medicine cabinet?

—Stacey Martin, Kennewick, Wash.

A: Your vanity and medicine cabinet will have to endure occasional water splashes and high humidity, Stacey. Polyurethane resists moisture damage, plus it survives light abrasion better than the alternatives. That also makes it hard to repair. Lacquer is easy to repair, but offers less protection from water and chemicals, and water-based finishes are difficult to repair and susceptible to such chemicals as ammonia-based glass cleaners.

One thing to consider about polyurethane: It adds an amber color that you may not want if you're using light-color woods such as maple. An alkyd-resin varnish, such as McCloskey Heirloom or Pratt & Lambert 38, dries slightly clearer and is easier to rub out, although that also makes it less abrasion-resistant. Whichever you choose, apply at least three full-strength coats inside and out for the moisture protection that bathroom projects require.

continued on page 14

A dust collection idea that's outside the box

Q: I have a small shop and want to upgrade to a dedicated dust collection system. What about placing the dust collector outside the shop walls? How good a shelter do I need? The advantage would be more space and less noise. Are there disadvantages?

—John Huseth, Alexandria, Minn.

A: Moving a dust collector outside your shop walls requires just a few precautions, John. First, give the equipment a tight shelter against rain, snow, and insects, like that shown at *right*. Then add a return air vent back to your shop to recycle heated or cooled indoor air. This also prevents a pressure buildup in the dust collector storage area, and a vacuum within the entire house that could reverse the venting of poisonous furnace and water heater exhaust gases, drawing them back into your house.

With your dust collector out of the shop, don't let "out of sight" become "out of mind" when it comes to emptying the collection bag or drum regularly. Post a dry-erase or chalkboard with the "last emptied" date where it acts as a constant reminder.

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Ebony with a Texas accent

Q: What is "Texas ebony," and where can I get some?

—Richard Baker, Madisonville, Texas

A: Texas ebony, Mexican ebony, or false acacia are nicknames for a species known as *Pithecellobium flexicaule*, Richard. The "ebony" part of Texas ebony overstates its color, though. The heartwood, as shown *below*, comes closer to a light walnut shade than true ebony's black.

Although these desert-hearty trees have reached 50' high with trunks 4' in diameter, you'll be hard-pressed to find such a specimen. These trees spend their early life more closely resembling a shrub, and their growth rate slows after passing 1' in height. That makes them perfect for bonsai projects and landscaping, but not the sort of species that yields enough heartwood to fill racks in a lumberyard.

We were able to find a source if you're determined to experiment with small pieces, especially for turning. Contact Curly Woods in McKinney, Texas, at 866/679-6637 or e-mail them at sales@curlywoods.com.

Give chair legs flat feet

Q: We recently purchased a set of chairs where the bottoms of the legs are cut perpendicular with the leg, causing one point of the leg to contact the floor instead of the entire end. I was told the legs are cut to industry standards. Is this possible?

–Rich Gardella, Lavallette, N.J.

A: We don't know of an "industry standard" for chair leg ends, Rich, but that doesn't matter when the chairs gouge holes in your floor. If there's a reason for the squared-off ends, it's probably because that's how the turnings came off a lathe at the furniture factory. It doesn't mean the legs need to stay that way, though.

Start by placing the chair on a flat surface such as a tablesaw top. Use a scrap of ¼" hardboard to raise the tip of a pencil, as shown *below*, and mark a line around the ends of the legs. Using a fine-tooth saw, carefully cut at the lines to bring the ends of the legs parallel with the flat surface.

If the leg lengths need to be fine-tuned, place four pieces of adhesive-backed, 120-grit sandpaper on the flat surface centered beneath the ends of all four legs. Then slide the chair leg ends back and forth across the sandpaper until all four rest firmly against the surface. To protect your floor, attach nylon (for rugs and carpet) or felt (for vinyl and hardwood) pads on the ends of the legs.

YOU'RE PROBABLY JUST AS AMBITIOUS.

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shop tips

Helping you work faster, smarter, and safer

For total recall, use this ready-reference technique

top shop tip

Because I experiment with different glues, stains, and finishes, I can't always remember which products I used on individual projects. So, instead of trusting my memory, I just write all this info, plus the build date, somewhere on the piece in an inconspicuous place. If I need to repair or refinish one of my pieces, I know exactly what the original materials were.

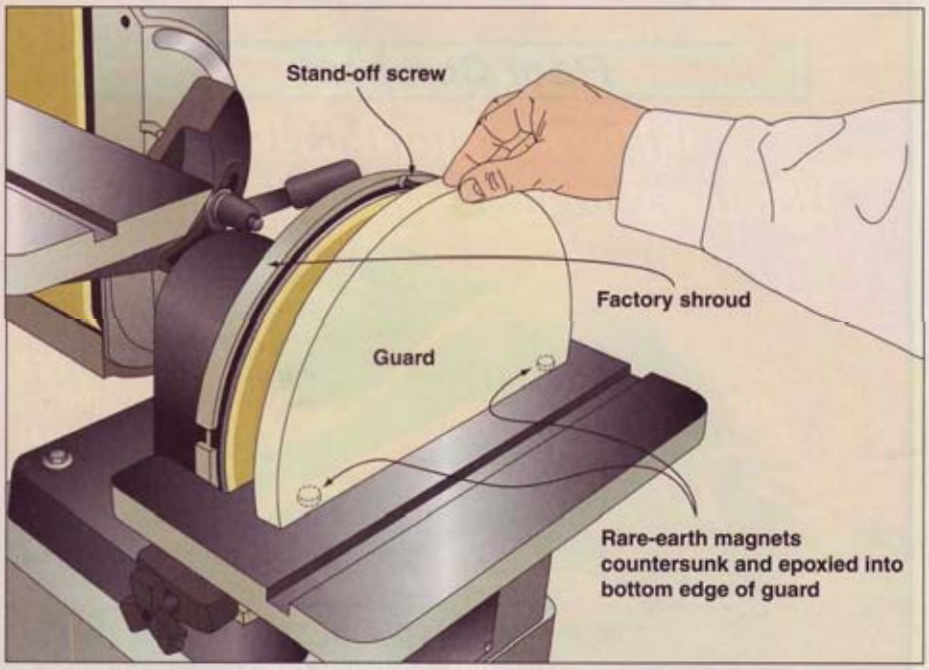
—Bruce Wilhelm, Spring, Texas

Safety shield stops sanding accidents

The problem with a belt-disc sander is that when I'm sanding on the belt, the disc still turns. I've lost count of the times I've accidentally raked a workpiece—or even my knuckles—against the spinning disc. To protect all wood and human parts, I built the simple disc guard, *below.*

To make your own guard, cut a half-circle the size of the factory shroud out of scrap ¾" material. Epoxy a couple of rare-earth magnets into its flat edge to hold it to the table. At the top of the guard, add a stand-off screw to keep the guard from tipping into the disc. I recommend painting the guard a bright color to highlight the need to have it in place when running the sander.

—Dick Butula, Germantown, Wis.



continued on page 18

The Top Tipster

Photo: Cliff Roe Photography

While riding his bike one day, Bruce Wilhelm noticed a nice piece of wood that had washed ashore on a bayou near his Texas home. Turns out this piece of "driftwood" was actually a solid oak tabletop, apparently separated from its home by a recent storm. After retrieving it, Bruce made the mission-style clock shown above, from plans in issue 84 (December 1995). We think you'll find Bruce's Top Shop Tip, at *top left*, equally resourceful.

Bruce Wilhelm receives a Delta 17-950L laser-guided drill press for sending in this issue's Top Shop Tip. Attaboy, Bruce!

Top tips earn tools!

Describe how you've solved a workshop stumper and you'll get $75 if we print it. And, if your tip garners Top Shop Tip honors, we'll also reward you with tool treasures worth at least $250.

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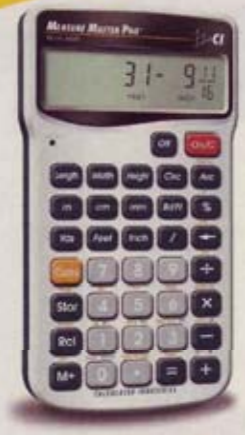

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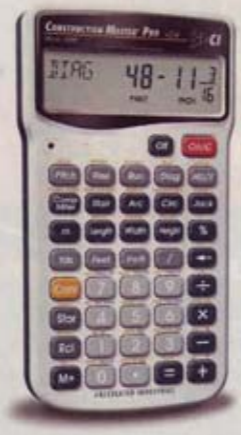

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shop tips

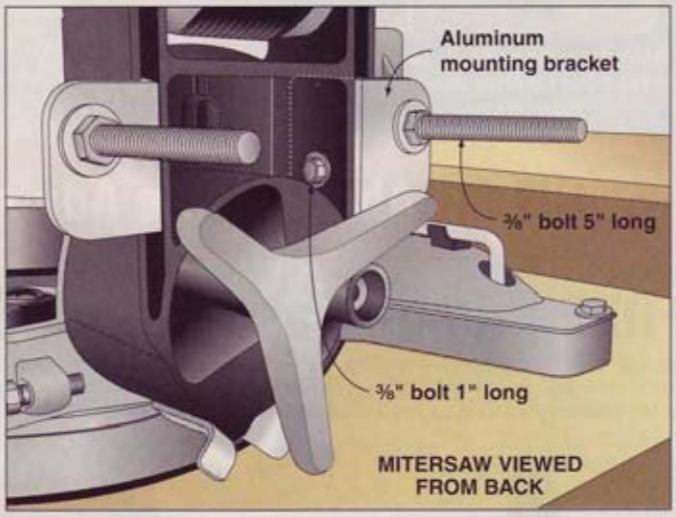
Dust hood has big appetite, and a mouth to match

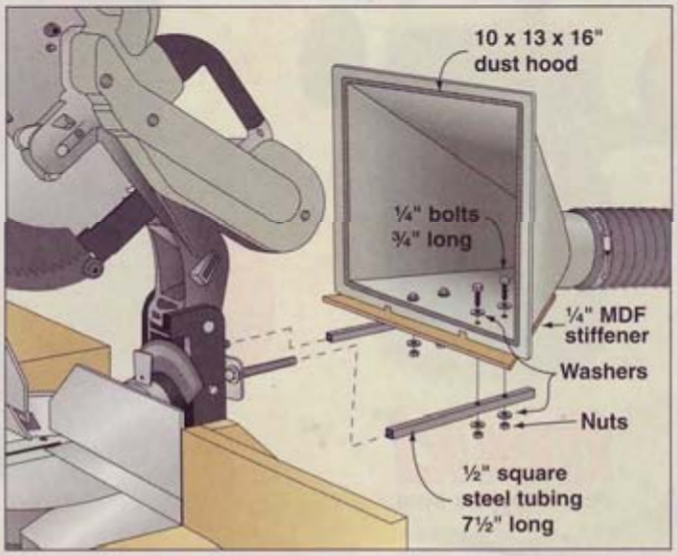
To catch the shotgun blast of dust that comes off the back of my DeWalt 12" mitersaw, I bought a "Big Gulp" dust hood ($20, Penn State Industries, 800/377-7297 or pennstateind.com). It worked well with the saw set to cut square, but caught less when I rotated the saw for a miter cut. To maximize dust collection at any angle, I came up with a way to mount the hood to the saw so that it always remains directly in the spray pattern—even when I'm beveling and making compound cuts.

I first fashioned a pair of L-shaped mounting brackets from 3/16" aluminum stock, bolted them to the saw's support column, as shown *below*, and installed long bolts through each bracket. Next, I made an MDF stiffener to match the base of the hood and bolted it to both the hood and a pair of square steel tubes spaced the same as the long bolts now protruding from the back of my mitersaw.

To install the hood, I simply slip the tubing over the bolts. The weight of the hood and hoses keep the hood from slipping off, and the hood tilts and rotates with the saw blade.

—Dan Chan, North Highlands, Calif.





continued on page 20

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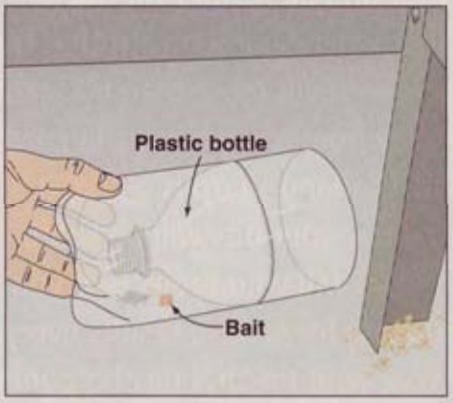
Circle No. 310

shop tips

2-liter critter catcher brings peace in the shop

While working in my basement shop, I was annoyed by a few noisy crickets. To catch the crickets, I cut the top off a plastic 2-liter soda bottle and reversed it, as shown *below*. I dropped a small piece of tomato into the trap for bait, and the crickets waltzed right in for a snack. It was then a simple matter of relocating the crickets to a place far away from my now-quiet shop and home.

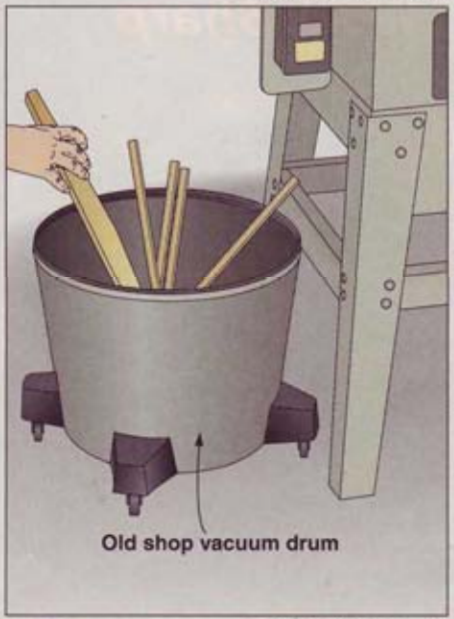
—Shirley Overton, East Hampton, N.Y.



Cruise around with this offcut caddy

When I had to replace my shop vacuum, I found a use for the old one's drum and wheels: I turned it into an offcut caddy, as shown *below*. It rolls to wherever it's needed.

—Kip Stratton, Otego, N.Y.



continued on page 24

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Circle No. 2039

shop tips

Ever-ready glue brushes that self-clean

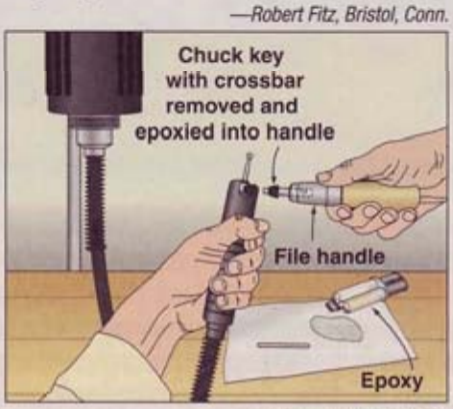
Whenever I have glue-ups to do, I prepare a small container of water with a piece of hardware cloth laid at the bottom. The screen edges are bent so the cloth stands off the container's bottom. When I place a used glue brush in the container, the glue runs off the bristles through the screen. Next time I need the brush, I just dry it off and it's ready to go with no dried glue clumps. At day's end, I simply rinse the container clean.

—Doug Denaro, Trenton, Ill.

Bigger handle for better leverage

I am an old carver, and my fingers just don't have the strength they once did, so changing tools in my chuck grinder with a chuck key was getting more difficult. I needed something I could grip with my entire hand instead of a few fingers. So I removed the chuck key's crossbar and drilled out an old file handle to accept the chuck key. I secured the key into the handle with epoxy, and now I change grinding bits in half the time with little or no joint pain.

—Robert Fitz, Bristol, Conn.

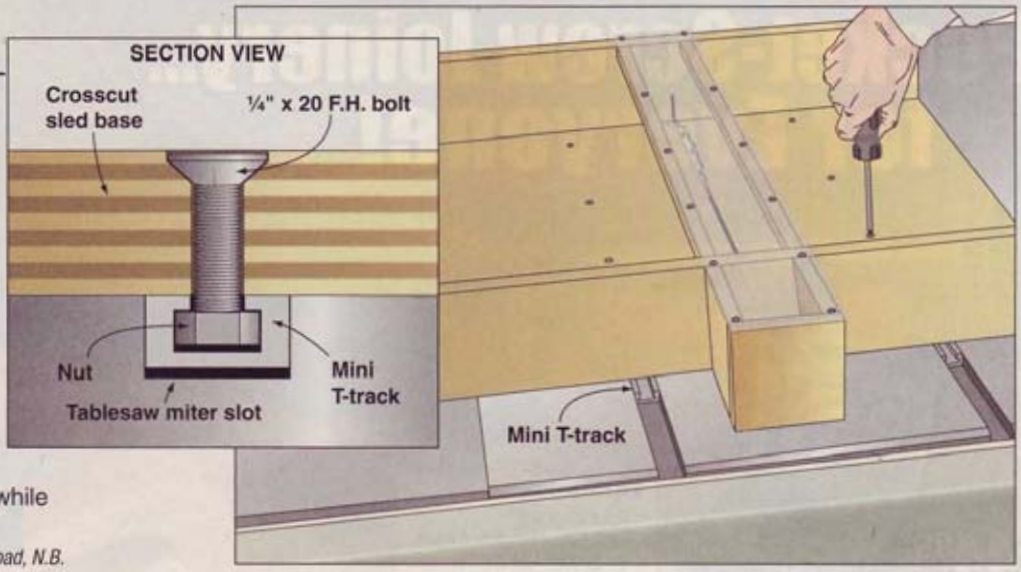


continued on page 26

Use T-tracks for dead-on runner accuracy

When I made my tablesaw crosscut sled, I used mini T-tracks, like those used in your Drill Press Table project in issue 156 (June/July 2004, page 52) for the runners. Besides giving me a more stable runner material than wood, the little bit of play between the mounting nut and the slot allowed me to fine-tune the precise location of the runners while installed on the tablesaw.

—Stephane Hamel, Richibucto Road, N.B.



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Power drivers are fine for some jobs, but their weight and bulk get in the way of others, while manual screwdrivers can sometimes be awkward to use. The slim profile of a spiral ratcheting screwdriver allows you to work close to an adjacent surface and can provide extended reach and considerable leverage.

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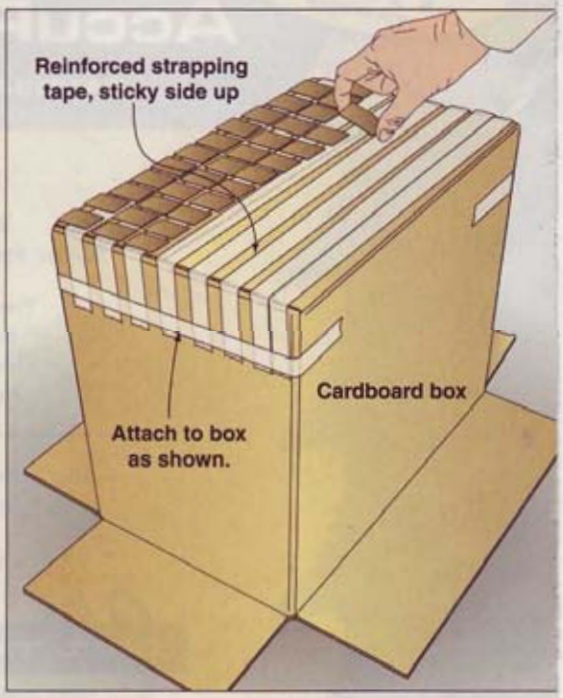
Circle No. 803

Tornado-proof mounting for small parts prep

While making my two granddaughters dollhouses for Christmas, I found painting all the small pieces—there are 850 thin roof shingles alone—a daunting task. For speed's sake, I decided to spray-paint the parts, but I had to find a way to prevent them from blowing away.

I created a grid of reinforced strapping tape (as shown *below*) with the sticky side up on top of a box. By pressing the shingles to the grid, I painted up to 200 at a time, and was able to reuse the grid several times before replacing it. With the time I saved, I actually got the houses finished by Christmas!

—Ellen Strange, Waverly, N.Y.



quick-to-make contemporary wall shelf

A great way to use plywood scraps.

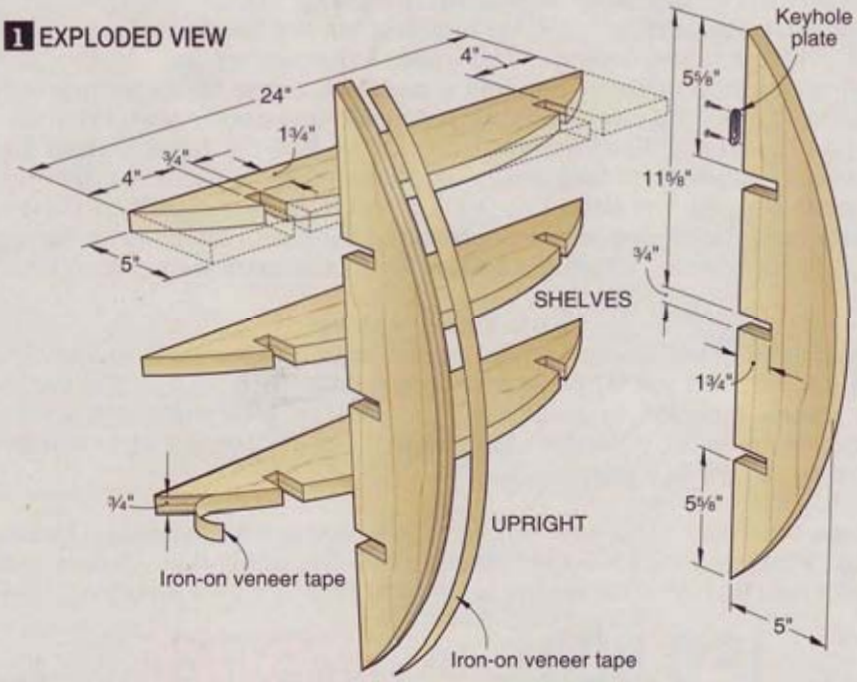
Start by cutting five pieces of ¾" plywood and one piece of ⅛" hardboard to 5" wide by 24" long. Lay out the graceful arc on the hardboard using a fairing stick. If you don't have one, see our free plan at woodmagazine.com/fairing. Bandsaw and sand the hardboard arc to shape. Using this as a template, trace the arc onto the face side of the five plywood blanks. Save the hardboard template for later use.

Mark the location of the keynote-plate mortises on the back edges of the two uprights **[Drawing 1a]**. Using a flat-bottomed bit, drill overlapping holes to form the mortises. Drill the pilot holes and check the fit of the plates in the recesses.

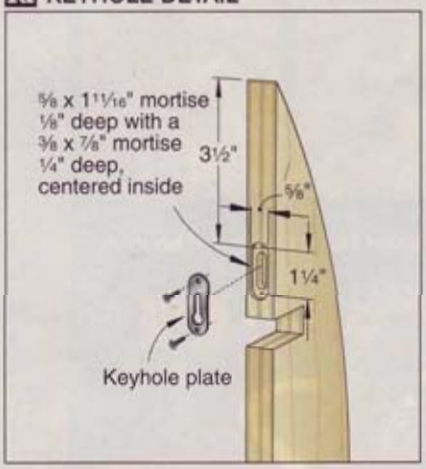
Next, mark the location of the notches on each piece of plywood, making sure the width of the notches matches the thickness of your plywood. Cut the notches to shape. (We did this on the tablesaw using a ⅛" blade, making multiple passes per notch.) For support, secure an auxiliary fence to your miter gauge and use a stop to ensure consistently placed notches. Bandsaw and sand the uprights and shelves to shape. Add the veneer tape to the front exposed plywood edges of the shelves and uprights using the article on *page 52* for reference. Glue the pieces together, checking for square. Wipe off any excess glue. Apply the finish, screw the keyhole plates in place, and hang.

Project design: **Kevin Boyle**

1 EXPLODED VIEW



1a KEYHOLE DETAIL



our editors test bandsaw guides

Why buy?

For the best results on your bandsaw, the blade must cut perpendicular to the table; but blades can twist or wander from the mark. Worn or ineffective blade guides and thrust bearings take the blame here, especially in older saws. These replacement guides, ranging in price from $16 to $150, deliver increased accuracy. Better still, they fit any 14" bandsaw, as well as many other models.

Spaceage Ceramic Guideblocks: guides, $16; thrust bearings, $18

Editor test-drive:

Because the Spaceage Ceramic Guideblocks (SCG) and thrust bearings matched my 14" Delta's original steel blocks and bearings in size and use the same mounting hardware, I didn't need to replace a bunch of parts to swap them out. I installed the top bearing and guides in 5 minutes, but replacing the lower thrust bearing took 45 minutes because I had to first remove the lower guide assembly. In doing so, I discovered the original bearing had seized; not a problem with the SCG bearing because it does not turn.

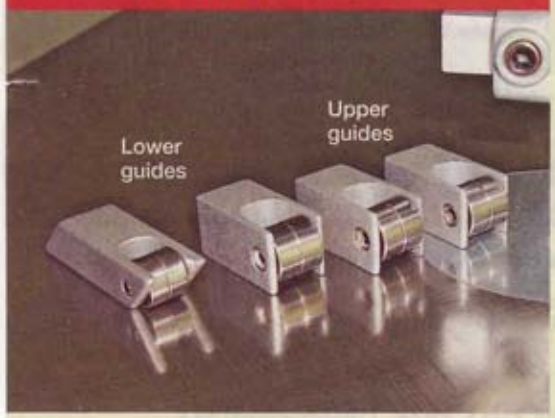
The manufacturer recommends .005" clearance between the blade and guides; I used the thickness of a piece of paper. I cut turning blanks from a variety of woods up to 6" thick and radii from 2" to 10" using ¼" and ¾" blades, and the slippery-smooth SCGs held the blade true without any sign of wear. Their low cost and durability make them an inexpensive but significant upgrade.

—Tested by Jan Svec, Projects Editor

To learn more:

916/652-6302;
spaceageceramicguideblocks.com

Iturra Band Rollers, $96



Editor test-drive:

Iturra's newest Band Rollers (model #10001HC, at left) feature ceramic bearings in steel housings. I installed them in my 14" Delta saw in about 15 minutes, as they slid into the existing guide holders and adjusted with the same setscrews. There are no replacement thrust bearings.

Using a feeler gauge, I positioned the bearings .003" from the blade, according to Iturra's instructions. Although Iturra does not recommend using its Band Rollers with blades less than ⅛", I tested mine with ⅛", ¼", and ½" blades, cutting thick stock and making tight-radius cuts to force the blade against the bearings. I found no problems in performance. By reducing the amount of blade twisting, the Band Rollers resulted in more accurate scrollcutting and resawing. These bearing guides showed no signs of wear, a big upgrade from my square-block graphite guides. Iturra also sells Band Rollers with steel bearings (model #10001), which sell for $58.

—Tested by Owen Duvall, Projects Editor

To learn more:

866/883-8064; email: kalll@comcast.net

Carter Conversion Kit, $150

Editor test-drive:

I spent a mere 15 minutes installing the Carter Conversion Kit on my 14" Jet bandsaw. It replaced not only the guides, but also my saw's entire upper and lower blade-guide assembly. I was surprised, however, to find that the two Allen wrenches needed to install and make adjustments to the bearings were not included in the kit.

I immediately noticed improved performance from my bandsaw as the bearing guides gave it a huge boost in accuracy. When cutting arcs and circular shapes—and especially in resawing—the bearings proved much better than my old graphite guides at holding the blade perpendicular to the workpiece with no twisting or deflection. Aside from the price tag, the only drawback I found was the increased noise as compared with my previous guides. But I'm willing to trade a little noise for the greatly superior cutting results.

—Tested by Kevin Boyle, Senior Design Editor

To learn more:

888/622-7837; carterproducts.com

drop-down drying rack

A great solution for small shops

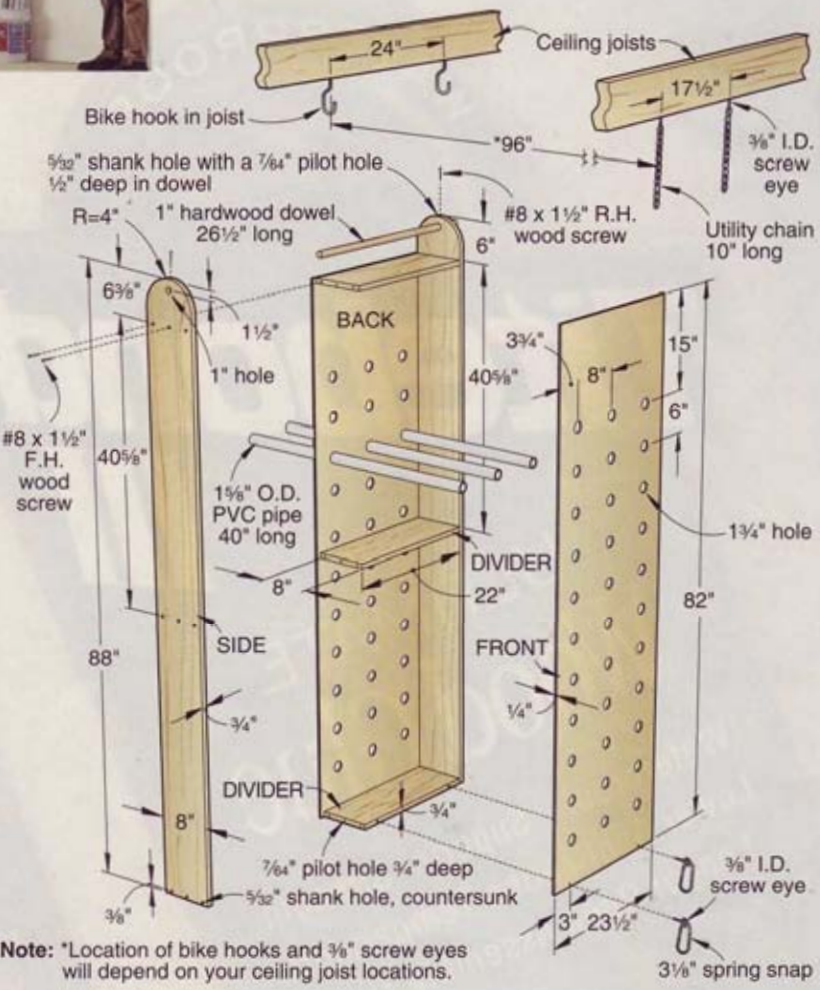
Lots of finishing to do, but limited on space? Try this multilevel drying rack. The removable PVC pipes allow you to create "shelves" for supporting cabinet doors and other workpieces while they dry. To build the rack, cut the front and back from ¼" plywood. Mark the hole centerpoints where dimensioned on one of the two pieces. Stick the pieces together with double-faced tape with the edges and ends flush. Use a 1¾" Forstner bit or circle cutter to bore holes through both pieces of stock at the same time. Back the stock to prevent chip-out.

Next, cut the two sides and three dividers to size from ¾" stock. Radius the top end of each sidepiece, and bore a 1" hole to house the hanging dowel. Drill all the mounting holes and assemble the unit in the configuration shown, checking for square. A screw in the top radiused end of each sidepiece secures the 1" dowel in place.

To mount the rack to the ceiling, drill the four mounting holes, and thread pairs of bike hooks and screw eyes into the pilot holes, where shown on the drawing. Add utility chain to the screw eyes. Finally, crosscut numerous pieces of 1⅝" PVC pipe to length.

When not needed, simply remove the PVC pipes from the rack. Then, lift the bottom end of the rack to the ceiling, securing the spring snaps to the utility chain, as shown in the photo *above*. Store the pipes in a five-gallon bucket.

Project design: **Tom Carrell, Metropolis, Ill.**



Note: *Location of bike hooks and ⅜" screw eyes will depend on your ceiling joist locations.

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heirloom corner cabinet

Display and store your fine collectibles in this beautifully trimmed design.

AT A GLANCE

- Overall dimensions are 37⅛" wide × 19¼" deep × 76¾" high.
- Materials used: Red oak solid stock, and birch and red oak plywood.
- The cabinet assembles easily and quickly with pocket screws, wood screws, and biscuits.
- The attractive molding and trim profiles are made using common round-over, cove, and Roman ogee router bits.
- You'll find a simple process for cutting the crown molding using a standard (not compound) mitersaw on *page 48*.
- A pair of cabinet lights install easily.

View a 15-photo Slide Show on the Corner Cabinet coming together at: woodmagazine.com/slides

Let's start with the cases

1 Cut the bottom- and top-case sides (A, B), back supports (C, D), and backs (E, F) to the sizes listed [**Materials List**, *page 47*]. (Cutting these parts for both cases now saves time by avoiding repetitive setups.) Bevel-rip one edge of the side pieces and both edges of the back supports and backs at 45° [**Drawings 1** and **2**]. Note the opposing grain directions for the back supports and backs.

2 Using a dado blade in your tablesaw that matches the thickness of your ¼" plywood, cut a ⅜"-deep dado on the *inside* face of each bottom-case side (A) [**Drawing 1**]. Then, using an auxiliary fence attached to your rip fence, cut a ⅜"-deep rabbet across the top of each top-case side (B) on the *inside* face [**Drawing 2**].

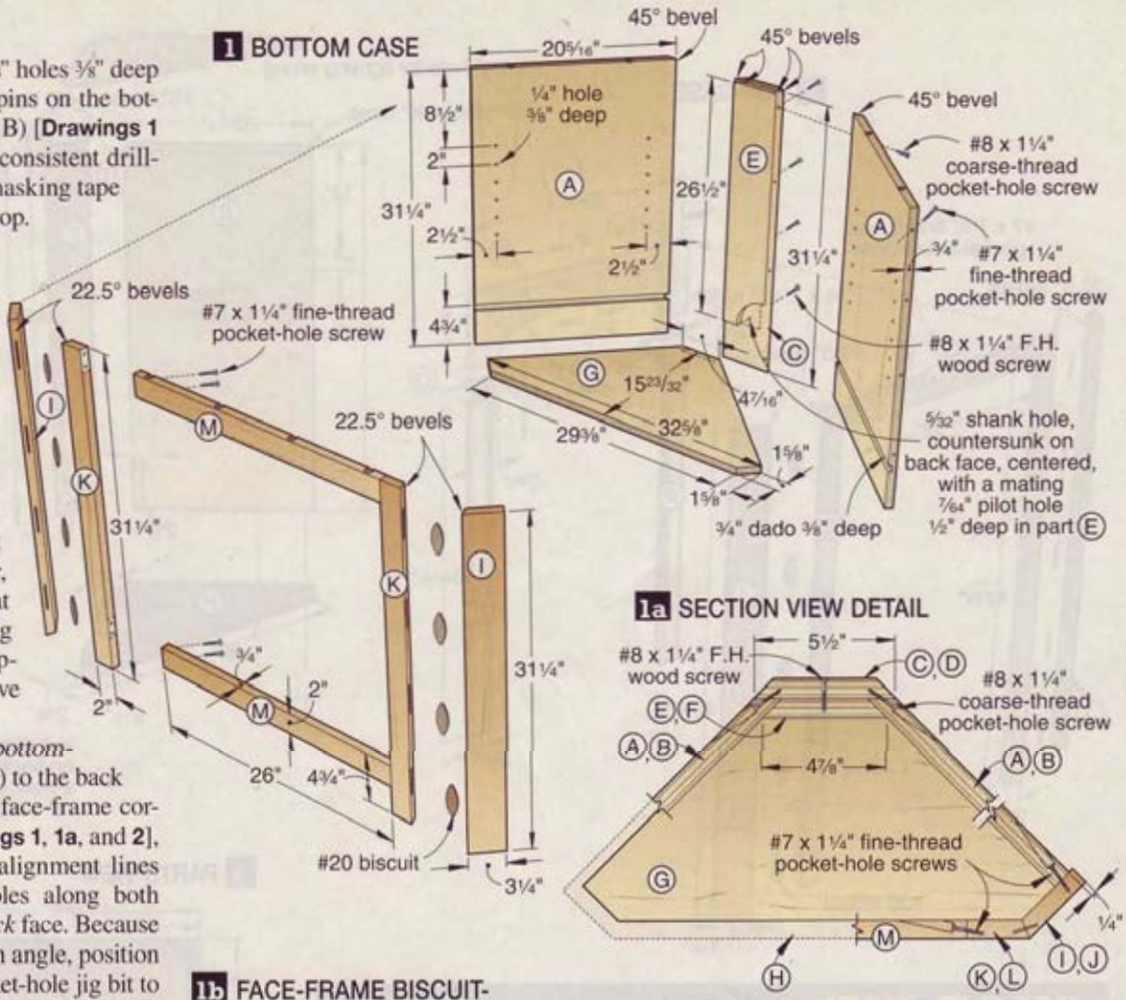
Easy-to-install, low-temperature xenon lights cast a soft glow on treasured pieces.

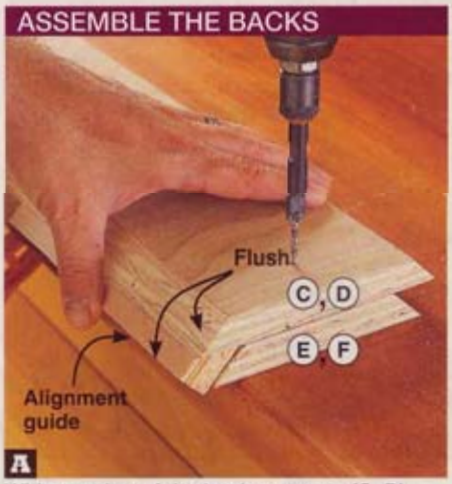
3 Mark centerpoints for ¼" holes ⅜" deep for ¼" cushioned shelf pins on the bottom- and top-case sides (A, B) [**Drawings 1** and **2**]. Drill the holes. For consistent drilling depth, wrap a piece of masking tape around the bit for a visual stop.

4 To mount the bottom- and top-case back supports (C, D) to the backs (E, F) [**Drawings 1, 1a,** and **2**], bevel-rip a 1½×12" piece of scrap ¾" plywood at 45° for an alignment guide. Using the guide to center each pair of parts side-to-side [**Photo A**], glue and clamp the back supports and backs together, keeping the parts flush at one end. Drill mounting holes through the back supports into the backs, and drive the screws.

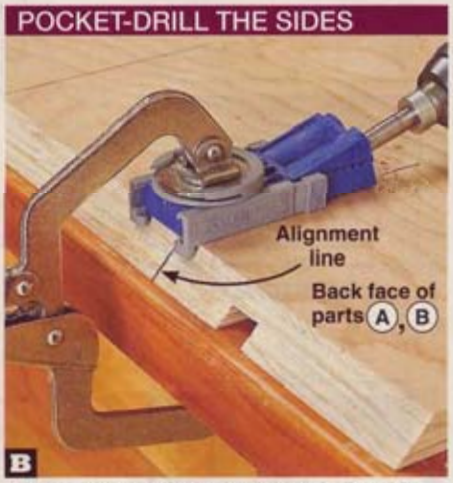
5 *To pocket-screw the bottom-* and top-case sides (A, B) to the back assemblies (C/E, D/F) and face-frame corner stiles (I, J) later [**Drawings 1, 1a,** and **2**], draw four equally spaced alignment lines for drilling the pocket holes along both edges of the sides on the *back* face. Because you're joining the parts at an angle, position the stop collar on your pocket-hole jig bit to drill ⅜" deeper than the indicated setting for joining ¾" material to ensure secure attachment. Position the jig, and drill the holes [**Photo B**].

6 Sand all of the parts to 220 grit. Then, with the bottom-case *left* side (A) and back assembly (C/E) correctly oriented [**Drawing 1**], apply glue along the V-shaped opening on the *left* side of the back assembly. Assemble the parts, and drive the pocket-hole screws [**Photo C**]. Join the right

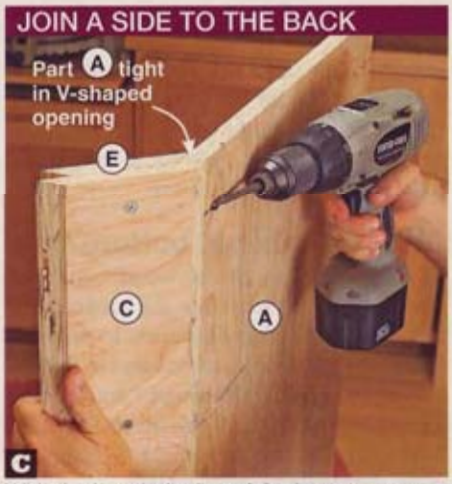




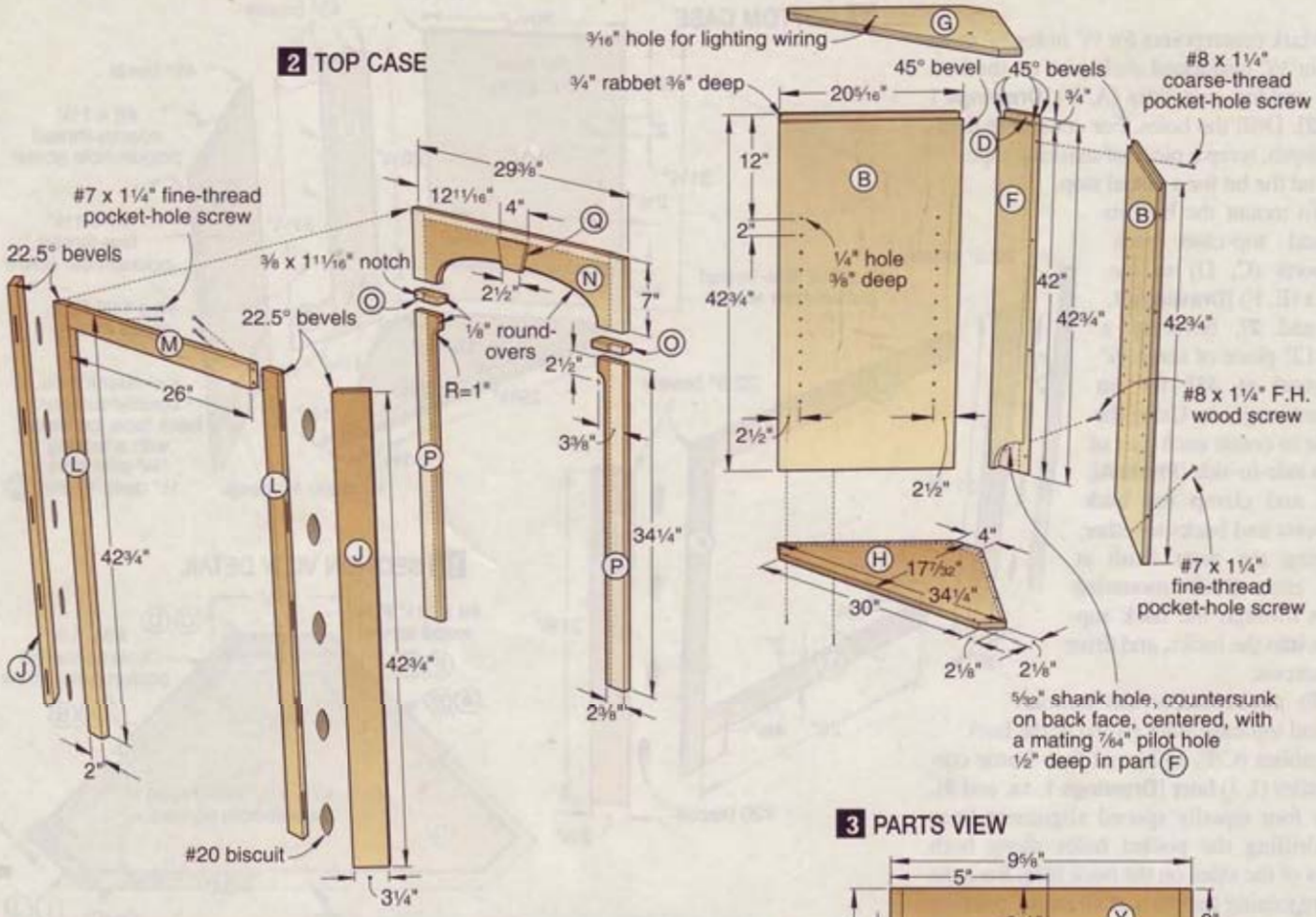
With an edge of the back supports (C, D) flush with the alignment guide, glue and screw the supports to the backs (E, F).

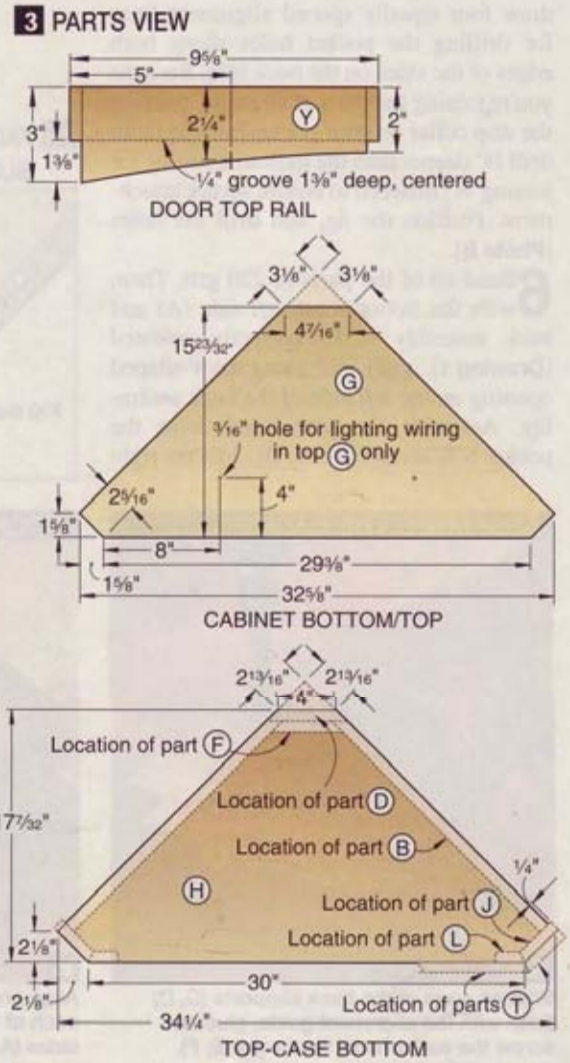


Align and clamp your pocket-hole jig with each of the marked lines on the back of the sides (A, B), and drill the holes.



With the beveled edge of the bottom-case *left* side (A) tight in the V-shaped opening in the back (C/E), drive the pocket screws.





SHOP TIP

Use the right pocket-screw thread type for the material

Pocket screws are available with coarse and fine threads, and it's important to use the correct thread to prevent splits in wood, plywood, and composite materials. Use fine-thread screws for hardwoods and coarse-thread screws for softwoods, plywoods, particleboard, and medium-density fiberboard.

Fine-thread screw for hardwoods

Coarse-thread screw for softwoods and plywoods

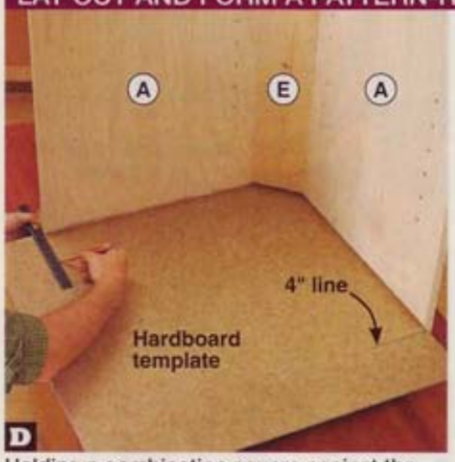
side (A) in the same way. Repeat to assemble the top-case sides (B) and back assembly (D/F). For guidance on using the right pocket-screw thread type for joining materials, see the **Shop Tip**, *above*.

Add the cabinet bottom/top

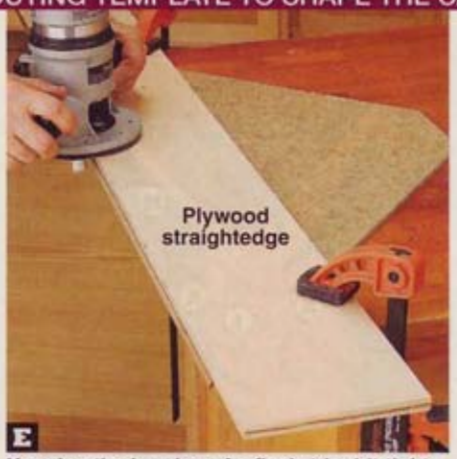
1 From 3/4" birch plywood, cut two 15 7/8x32 3/4" pieces for the cabinet bottom/top (G). To shape the parts to precisely fit into the 3/4" dadoes and rabbets in the bottom and top cases [**Drawings 1** and **2**], cut a 27"-square piece of 1/4" hardboard to make a template for pattern-routing. Measure for equal diagonals to verify square.

2 Draw a 4 7/16"-long line (for the back) across a corner of the hardboard [**Draw-**

LAY OUT AND FORM A PATTERN-ROUTING TEMPLATE TO SHAPE THE CABINET BOTTOM/TOP



Holding a combination square against the edge of each bottom-case side (A), draw a 4"-long line on the hardboard template.



Keeping the bearing of a flush-trim bit tight against a plywood straightedge, true the front edge of the hardboard template.

Positioning each side of the template tight against the fence of your mitersaw, cut the corners along the marked lines.

ing 3]. Cut off the corner using your mitersaw set at 45°. Next, position the hardboard in the dadoes in the bottom-case sides (A) and tight against the back support (C). Draw 4"-long lines on the hardboard extending from the front edges of the sides [**Photo D**]. Then make a mark 2 5/16" from the edge of the hardboard (*not* the back face of the side) intersecting each 4" line. Align a straightedge with the intersecting points, and draw a line (for the front edge) across the hardboard.

3 Jigsaw the hardboard to within 1/8" of the line. Save the cutoff—you'll use it to make a template for pattern-routing the top-case bottom (H) to shape later. Next, clamp an 8×48" piece of 1/2" plywood having a straight edge to the hardboard, aligning the edge with the line. Using your router with a top-bearing flush-trim bit, true the edge [**Photo E**]. Now cut the front corners of the template [**Photo F**].

4 Using double-faced tape, adhere the template, centered, to one of the plywood pieces for the bottom/top (G). Jigsaw the plywood to within 1/16" of the template, all around. Then pattern-rout the plywood, using the template as a guide for the bearing of your flush-trim bit [**Photo G**]. Remove the template. Repeat to shape the remaining piece of plywood.

5 For the cabinet top (G), drill two 3/16" holes for the lighting wiring [**Drawing 3**]. Sand the bottom and top pieces smooth. Then glue and clamp them in place in the bottom and top cases.

6 From 3/4" red oak plywood, cut a 17 3/8×34 3/8" piece for the top-case bottom (H). Set the piece aside. You'll make a template and pattern-rout it to final shape after mounting the face frame to the case.

7 Apply a coat of primer to the front faces of the top-case sides (B) and back (F) and bottom face of the cabinet top (G). Then apply two coats of interior latex paint. (We used Behr semigloss Silk Gown.)

On to the face frames

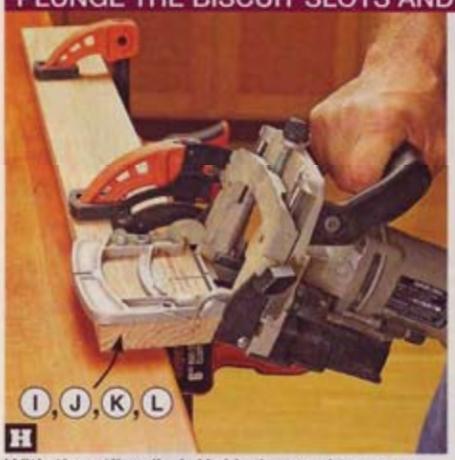
1 Cut the bottom- and top-case corner stiles (I, J) and front stiles (K, L) for the face frames to the sizes listed to fit the cases, bevel-ripping an edge of each piece at 22.5° [**Drawings 1** and **2**]. Then cut the rails (M) to size except 1/2" longer to allow for precise fitting between the front stiles.

2 Pair the bottom-case corner and front stiles (I, K) and top-case corner and front stiles (J, L) together. Mark centerlines on the *outside* faces for #20 biscuit slots, where shown. Adjust your biscuit-joiner fence to center the cutter 5/16" from the *back* face of the stiles on the *beveled* edges [**Drawing 1b**]. (This prevents the cutter from breaking through the outside face.) Plunge the slots [**Photo H**]. Then glue and biscuit the stiles together [**Photo I**].

PATTERN-ROUT THE BOTTOM/TOP

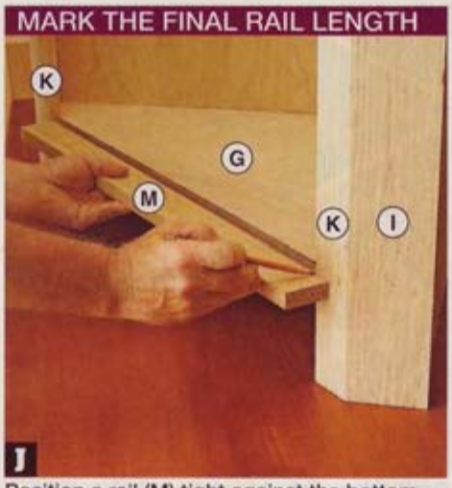
Keeping the bearing of the flush-trim bit tight against the hardboard template, pattern-rout the plywood bottom/top (G) to shape.

PLUNGE THE BISCUIT SLOTS AND ASSEMBLE THE STILES

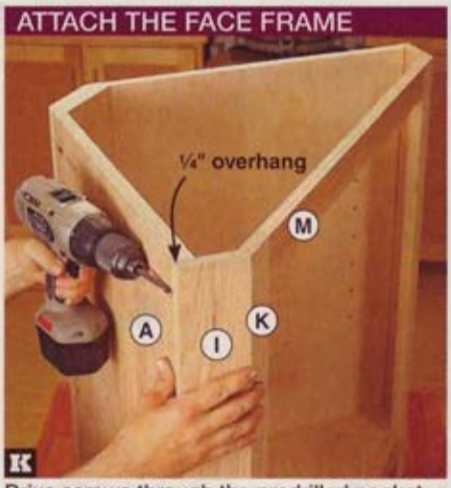


With the stiles (I, J, K, L) clamped to your workbench, plunge #20 biscuit slots into the beveled edges at the marked centerlines.

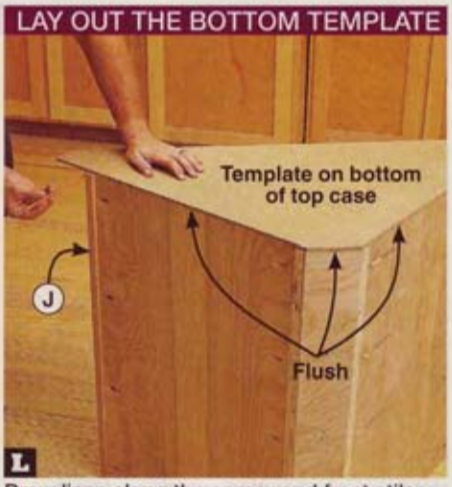
Glue and biscuit the bottom- and top-case corner stiles (I, J) and front stiles (K, L) together, drawing the joints tight with tape.



Position a rail (M) tight against the bottom-case left front stile (K) and overlapping the right corner stile. Mark the final rail length.



Drive screws through the predrilled pocket holes in the sides (A) into the corner stiles (I) to fasten the face frame to the bottom case.



Draw lines along the corner and front stiles (J, L) to lay out the hardboard template for pattern-routing the top-case bottom (H).

3 To cut the rails (M) to finished length, position the bottom-case stile assemblies (I/K) on the case, tight against the angled corners of the cabinet bottom (G) with the corner stiles (I) overhanging the sides (A) ¼" [**Drawing 1a**]. Mark the exact length of a rail to fit between the front stiles (K) [**Photo J**]. Using a stopblock on your miter gauge for consistency, crosscut the three rails to the marked length.

4 To assemble the face frames, lay out the bottom- and top-case stile assemblies (I/K, J/L) and rails (M) front face down on a flat surface in the configurations shown [**Drawings 1** and **2**]. Clamp the frame members together, making sure to position the bottom rail of the bottom-case face frame where dimensioned. With the stop collar repositioned on your pocket-hole jig drill bit to the normal position for ¾" material, drill a pair of holes at both ends of each rail, where shown. Apply glue to the rail ends, and drive the pocket-hole screws.

5 Position the bottom-case face-frame assembly (I/K/M) on the case. Pocket-screw the frame to the case [**Photo K**]. Set the top-case face-frame assembly (J/L/M) aside.

6 To join the bottom and top cases together later, mark centerpoints for mounting figure-eight fasteners on the top edges of the bottom-case sides (A) and face-frame top rail (M) [**Drawings 1** and **1c**]. Using a ¾" Forstner bit, drill a ⅛"-deep counterbore at each centerpoint, as explained in the **Shop Tip**, *below*. Next, drill a centered 3/32" pilot hole ½" deep in each counterbore. You'll mount the fasteners later.

Make the top-case bottom

1 As you did for the cabinet bottom/top (G), make a template for pattern-routing the top-case bottom (H) to shape using the ¼" hardboard cutoff that you set aside earlier. Draw a 4"-long line (for the back) across a corner of the hardboard [**Drawing 3**]. Cut the corner using your mitersaw.

2 Place the top case with the bottom up. Then position the hardboard on the case, flush with the back and sides. Mark the locations of the face-frame corner stiles (J) and front stiles (L) on the template [**Photo L**]. Remove the template.

3 Align a straightedge with the marked lines for the front stiles (L), and draw a line across the template. Jigsaw to within 1/16" of the line. As before, true the edge using your flush-trim router bit and plywood straightedge. Then cut the front corners along the marked lines using your mitersaw.

4 Adhere the template, centered, to the 17⅜×34⅜" piece of plywood that you set aside for the bottom (H). Pattern-rout the bottom to shape, and remove the template. Sand the bottom smooth, and set it aside.

Trim the top-case interior

1 Cut the top-case rail (N) to the size listed. Make two copies of the rail full-size half-pattern from the *WOOD Patterns®* insert. Spray-adhere the patterns to the rail. (You'll need to flip the pattern over for the right side.) Bandsaw and drum-sand the arch to the pattern line. Then rout a ⅛" round-over along the front edge of the arch [**Drawing 2**].

2 To form the capitals (O), cut a 1½×8" blank from ¾" red oak. Using a dado blade in your tablesaw, cut a ⅜×3⅞" notch, centered, into one edge. Rout a ⅛" round-over along the indicated edges, ends, and corners of the blank [**Drawings 2** and **3**]. Then, using a stopblock attached to a miter-gauge extension, crosscut a 3¾"-long capital from each end of the blank.

3 Cut the stiles (P) to size. Lay out the radiused cutout on each stile [**Drawing 2**]. Bandsaw and sand the cutouts smooth. Then rout a ⅛" round-over along the *front* shaped edge of each stile.

SHOP TIP

How to easily drill partial counterbores

Here's a simple and controllable way to drill counterbores that break through the edge of a workpiece, such as those for the figure-eight fasteners used to join the bottom and top cases together. Clamp a piece of ¾" scrap to the workpiece, flush with the drilling surface, as shown. Then drill the counterbore using a Forstner bit. The scrap provides a continuous surface that keeps the bit from wandering and prevents tear-out.

4 Cut the keystone (Q) to size. Lay out the angled ends [**Drawing 3**]. Then bandsaw and sand to shape.

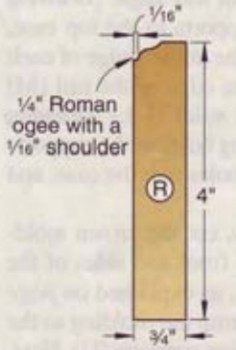
5 Sand the rail (N), capitals (O), stiles (P), and keystone (Q) smooth. Then place the top-case face-frame assembly (J/L/M) on your workbench with the back face up. Glue and clamp the rail to the frame [**Photo M**, *page 44*]. Next, glue and clamp a capital and stile to each front stile (L) [**Photo N**]. Now glue and clamp the keystone, centered, to the front of the rail, tight against the face-frame rail (M).

6 As you did for the bottom case, position the face-frame/trim assembly (J/L/M/N/O/P/Q) on the top case, verifying that the corner stiles (J) uniformly overhang the sides (B) ¼" [**Drawing 1a**]. Drive the pocket-hole screws through the predrilled holes in the sides into the corner stiles to secure the assembly to the case.

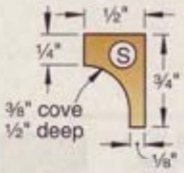
Next up: the cabinet trim

1 Cut the bottom-case base-trim blank (R) to size. Rout a ¼" Roman ogee with a 1/16" shoulder along an edge of the blank [**Drawing 4**].

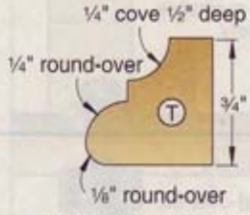
4 TRIM/MOLDING PROFILES



BOTTOM-CASE BASE TRIM

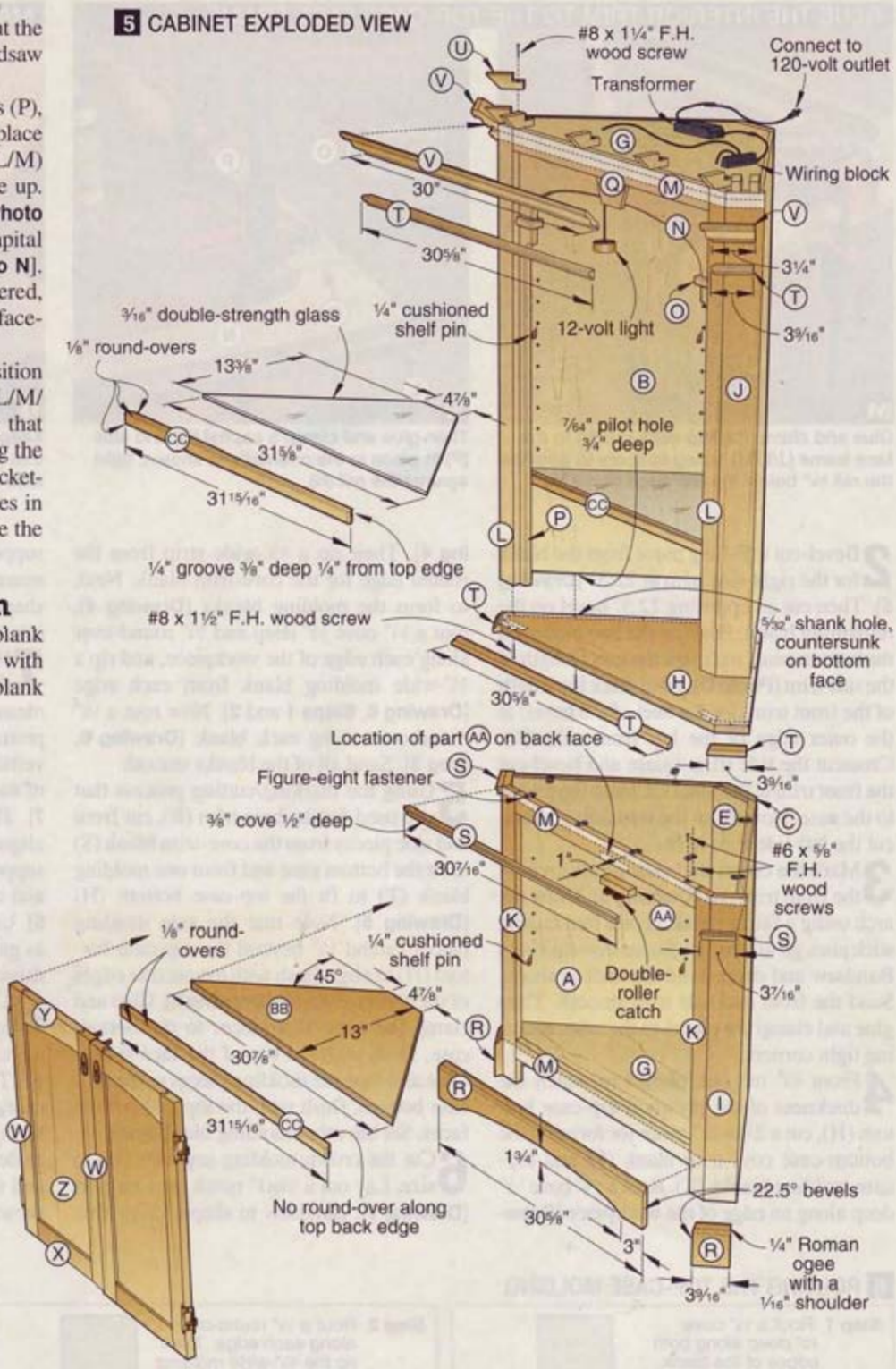


BOTTOM-CASE COVE TRIM

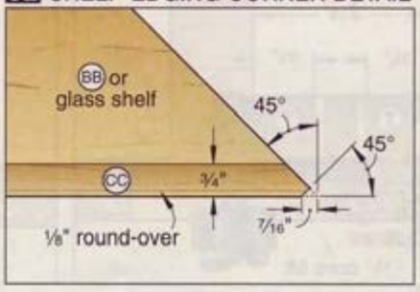


TOP-CASE MOLDING

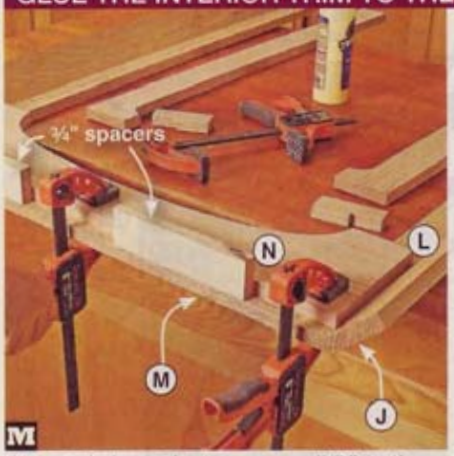
5 CABINET EXPLODED VIEW



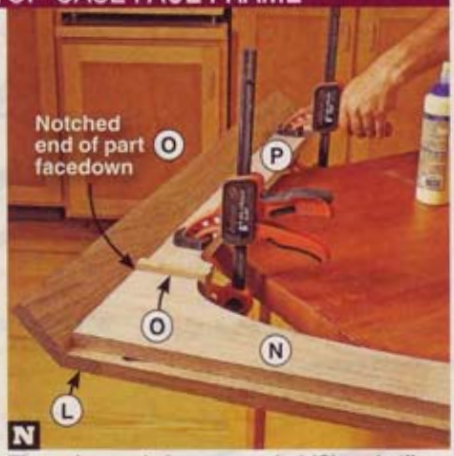
5a SHELF-EDGING CORNER DETAIL



GLUE THE INTERIOR TRIM TO THE TOP-CASE FACE FRAME

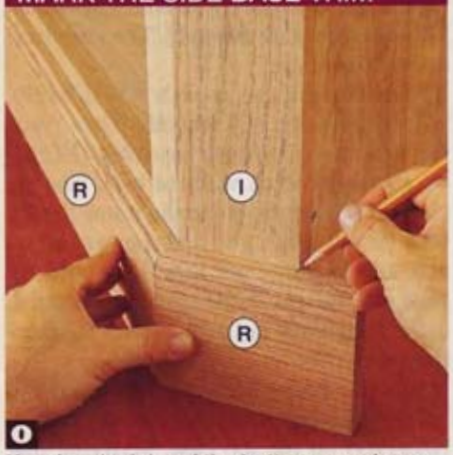


Glue and clamp the top-case rail (N) to the face frame (J/L/M), using spacers to position the rail ¾" below the top edge of rail M.



Then glue and clamp a capital (O) and stile (P) in place in the orientations shown, tight against the rail (N).

MARK THE SIDE BASE TRIM



Keeping the joint of the bottom-case base trim (R) pieces tight, mark the length of the side trim at the edge of the corner stile (I).

2 Bevel-cut a 5"-long piece from the blank for the right side trim at 22.5° [**Drawing 5**]. Then cut an opposing 22.5° bevel on the remaining blank. Position the two pieces on the bottom case, and mark the exact length of the side trim [**Photo O**]. Also mark the length of the front trim (for the heel of the bevel) at the outer edge of the left front stile (K). Crosscut the side trim square and bevel-cut the front trim at the marks. Clamp the pieces to the case. Now, from the remaining blank, cut the left side trim to fit.

3 Mark the center and ends of the arch on the front trim (R) [**Drawing 5**]. Draw the arch using a fairing stick. (For a free fairing stick plan, go to woodmagazine.com/fairing.) Bandsaw and drum-sand the arch to shape. Sand the front and side trim smooth. Then glue and clamp the pieces to the case, ensuring tight corners.

4 From ¾" red oak planed to match the thickness of the plywood top-case bottom (H), cut a 2¼×42" piece for forming the bottom-case cove-trim blank (S) and top-case molding blanks (T). Rout a ⅜" cove ½" deep along an edge of the workpiece [**Drawing 4**]. Then rip a ½"-wide strip from the routed edge for the cove-trim blank. Next, to form the molding blanks [**Drawing 4**], rout a ¼" cove ½" deep and ¼" round-over along each edge of the workpiece, and rip a ¾"-wide molding blank from each edge [**Drawing 6, Steps 1** and **2**]. Now rout a ⅛" round-over along each blank [**Drawing 6, Step 3**]. Sand all of the blanks smooth.

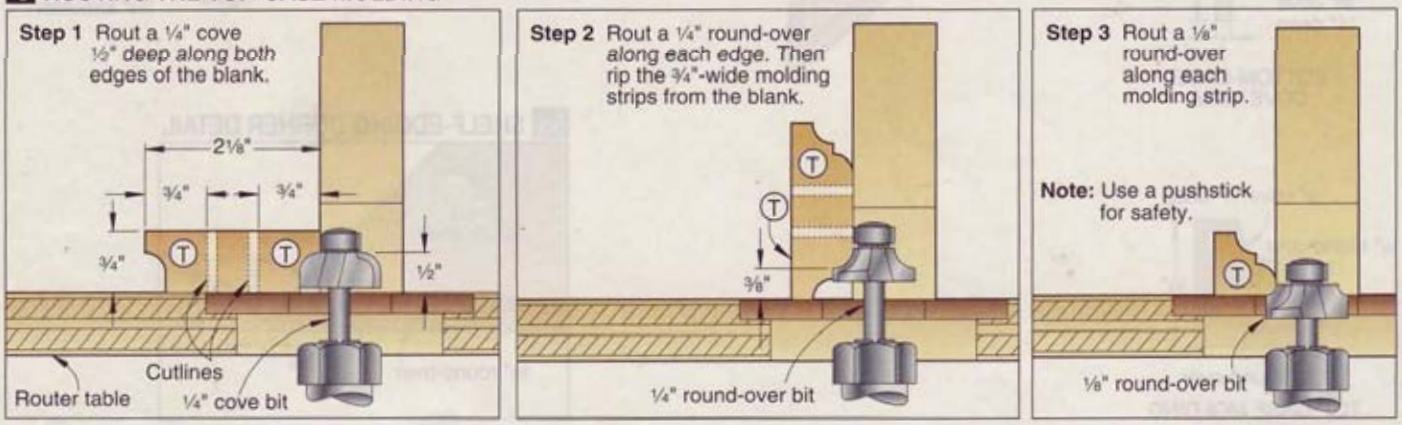
5 Using the marking/cutting process that you used for the base trim (R), cut front and side pieces from the cove-trim blank (S) to fit the bottom case and from one molding blank (T) to fit the top-case bottom (H) [**Drawing 5**]. Note that the side molding pieces extend ¼" beyond the top-case bottom (H) to align flush with the outside edges of the corner stiles (J) [**Drawing 3**]. Glue and clamp the cove-trim pieces to the bottom case, flush with the top of the face frame. Glue and tape the molding pieces to the top-case bottom, flush with the top and bottom faces. Set the other molding blank aside.

6 Cut the crown molding supports (U) to size. Lay out a ⅝×1" notch on a support [**Drawing 7**]. Bandsaw to shape. Using this support as a template, mark the notch on the remaining supports. Bandsaw and sand to shape. Then drill a mounting hole, centered, into the notched end of each support.

7 Holding your crown molding (V) with the bottom edge flush on a flat surface, measure the angle to the back face with a protractor. (Our molding measured 38° from vertical.) Using your mitersaw, cut the end of each support (U) at this angle [**Drawing 7**]. Then glue the supports to the top case, aligning the heel of the angled edge of each support with the front edge of the rail (M) and corner and front stiles (J, L) [**Drawing 5**]. Using the mounting holes in the supports as guides, drill pilot holes into the case, and drive the screws.

8 Using a mitersaw, cut the crown molding (V) to fit the front and sides of the top case [**Drawing 5**], as explained on *page 48*. Then glue and clamp the molding to the case and crown molding supports (U). Next, from the molding blank (T) that you set aside, miter-cut pieces to fit the case. Glue and tape them in position, tight against the crown molding.

6 ROUTING THE TOP-CASE MOLDING



FORM THE DOOR-RAIL TENONS

Using an auxiliary fence attached to your rip fence, cut a ¼" tenon ⅜" long on each end of the bottom and top rails (X, Y).

Swing over to the doors

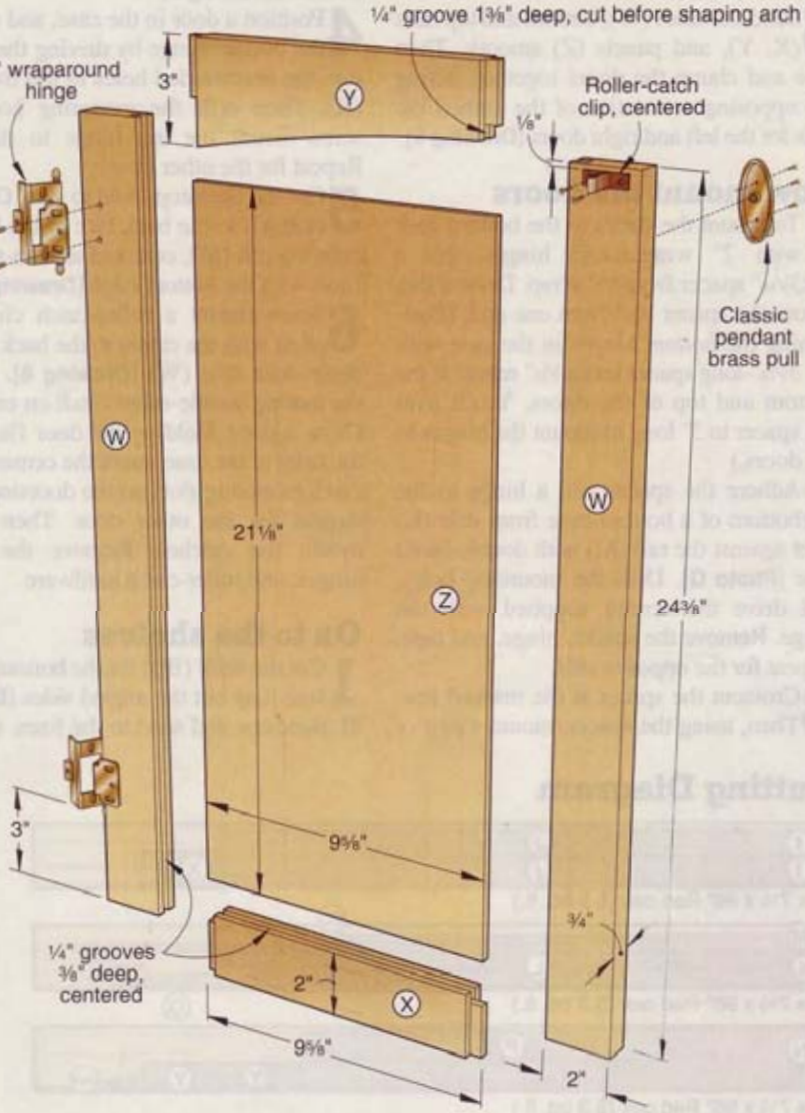
1 Cut the stiles (W), bottom rails (X), top rails (Y), and panels (Z) to the sizes *listed, saving your cutoffs.*

2 To cut ¼" grooves ⅜" deep in the stiles (W) and bottom rails (X) and ¼" grooves 1⅜" deep in the top rails (Y) to fit the plywood panels (Z) [**Drawing 8**], cut a centered groove along the *inside* edge of each part using a standard blade in your tablesaw. Reposition the fence. Then, making two passes and flipping each part end for end, widen the grooves to fit the panels. (We made test cuts in cutoffs first to ensure a good fit.)

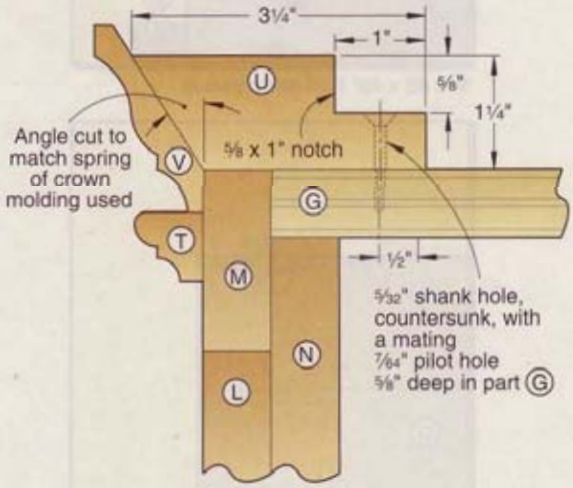
3 Using a dado blade, form a ¼" tenon ⅜" long on each end of the bottom and top rails (X, Y) [**Drawings 8** and **8a**, **Photo P**].

4 Adhere the top rails (Y) together with double-faced tape, keeping the edges and ends aligned. Mark points for the arch

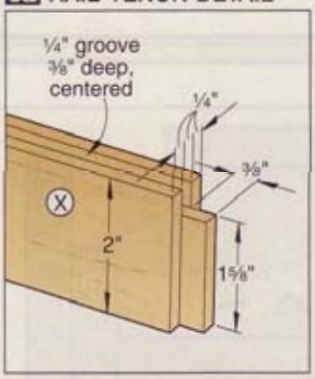
8 BOTTOM-CASE CABINET DOOR (Inside of right door shown)



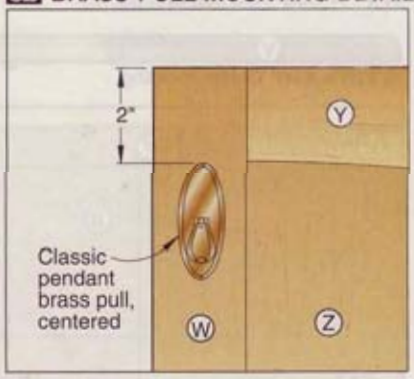
7 CROWN MOLDING SUPPORT SECTION VIEW



8a RAIL-TENON DETAIL



8b BRASS-PULL MOUNTING DETAIL



on the face of one rail [**Drawing 3**]. Draw the arch. Then bandsaw and drum-sand to shape. Separate the rails.

5 Sand the stiles (W), bottom and top rails (X, Y), and panels (Z) smooth. Then glue and clamp the doors together, noting the opposing orientation of the arched top rails for the left and right doors [**Drawing 5**].

Now mount the doors

1 To mount the doors to the bottom case with 2" wraparound hinges, cut a ¾x3$\frac{1}{16}$" spacer from ¼" scrap. Draw a line across the spacer $\frac{1}{16}$" from one end. (Positioning the *bottom* hinges in the case with the 3$\frac{1}{16}$"-long spacer sets a $\frac{1}{16}$" reveal at the bottom and top of the doors. You'll trim the spacer to 3" long to mount the hinges to the doors.)

2 Adhere the spacer and a hinge to the bottom of a bottom-case front stile (K) tight against the rail (M) with double-faced tape [**Photo Q**]. Drill the mounting holes, and drive the screws supplied with the hinge. Remove the spacer, hinge, and tape. Repeat for the opposite stile.

3 Crosscut the spacer at the marked line. Then, using the spacer, mount a pair of hinges on the *back* face of the outer door stile (W) of each door, 3" from the top and bottom [**Drawing 8**].

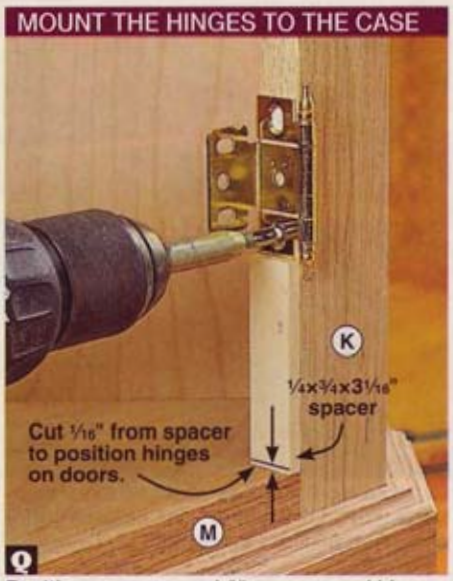
4 Position a door in the case, and reattach the bottom hinge by driving the screws into the prethreaded holes in the front stile (K). Then drill the mounting holes and screw-mount the top hinge to the stile. Repeat for the other door.

5 Cut the doorstop (AA) to size. Glue and clamp it to the back face of the bottom-case top rail (M), centered side-to-side and flush with the bottom edge [**Drawing 5**].

6 Screw-mount a roller-catch clip (supplied with the catch) to the back of each inner door stile (W) [**Drawing 8**]. Engage the mating double-roller catch on each clip. Close a door. Holding the door flush with the front of the case, mark the centers of the catch mounting slots on the doorstop (AA). Repeat for the other door. Then screw-mount the catches. Remove the doors, hinges, and roller-catch hardware.

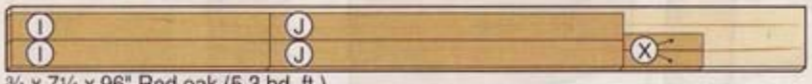
On to the shelves

1 Cut the shelf (BB) for the bottom case to size. Lay out the angled sides [**Drawing 5**]. Bandsaw and sand to the lines. (We did



Position a spacer and 2" wraparound hinge at the bottom of a bottom-case stile (K). Drill the mounting holes, and drive the screws.

Cutting Diagram



¾ x 7¼ x 96" Red oak (5.3 bd. ft.)

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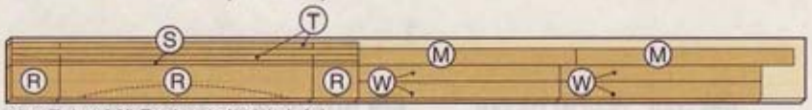
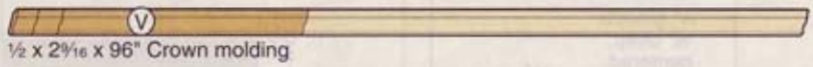
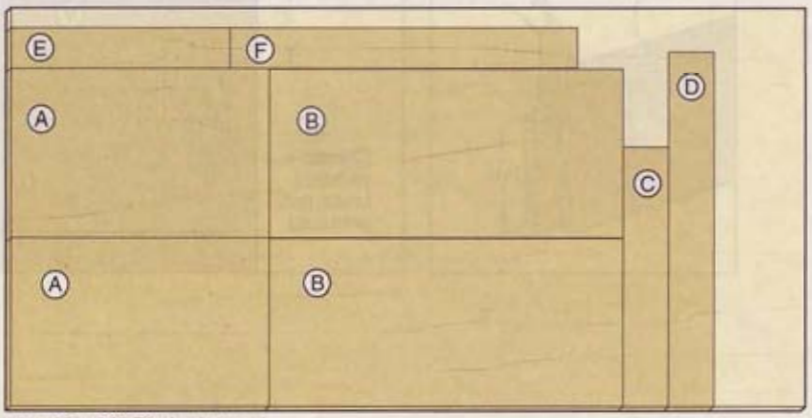


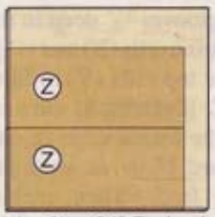
¾ x 7¼ x 96" Red oak (5.3 bd. ft.)



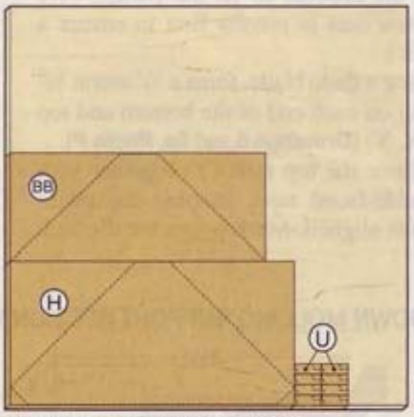
½ x 2$\frac{9}{16}$ x 96" Crown molding



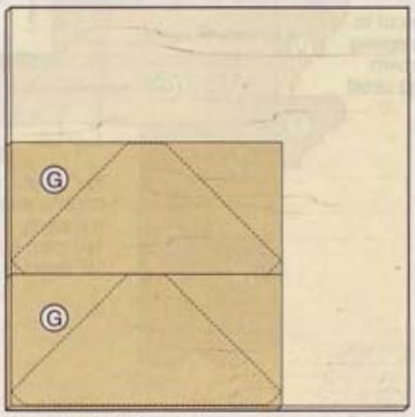
¾ x 48 x 96" Birch plywood



¼ x 24 x 24" Red oak plywood



¾ x 48 x 48" Red oak plywood



¾ x 48 x 48" Birch plywood

not pattern-rout the shelf because it fits loosely in the case.)

2 Cut the shelf edging (CC) to size except 32⅜" long. Make two 45° miter cuts at each end of the three edging pieces, where dimensioned [**Drawing 5a**], cutting the pieces to the finished length. Then rout ⅛" round-overs along the edges [**Drawing 5**], noting the additional round-over along the top back edge of two edging pieces for the top-case glass shelves.

3 Glue and tape the edging piece for the shelf (BB) to the front edge, flush with the ends and top face. When the glue dries, remove the tape, and sand the shelf and edging smooth.

4 Using a dado blade, cut a ¼" groove ⅜" deep ¼" from the top edge of the remaining shelf edging (CC) pieces on the back face, where shown. Sand smooth, and set the pieces aside.

5 To make a template for having two 3/16" double-strength glass shelves cut to fit the top case, *lay out the glass-shelf dimensions* [**Drawing 5**] on a piece of ¼" hardboard. Cut the hardboard to shape. Using ¼" cushioned shelf pins, test-fit the hardboard in the top case, and trim if needed. Then take the template to a glass shop and have the pieces cut to size.

Time to wrap things up

1 As needed, finish-sand the bottom and top cases, doors, top-case bottom (H/T), and bottom-case shelf to 220 grit, and remove the dust. Mask the painted areas in the top case. Remove all hardware. Then apply a stain to the cases, doors, top-case bottom, shelf, and two shelf edging pieces (CC) for the glass shelves. (We used Zar Oil-Based Stain, no. 110 Salem Maple.) Remove the masking from the top case. Now apply a clear finish to all of the parts, including the painted surfaces. (We applied three coats of AquaZar Water-Based Clear Satin Polyurethane, sanding to 320 grit between coats.)

2 Mount figure-eight fasteners in the counterbores in the bottom case using #6×⅝" flathead wood screws [**Drawing 1c**].

3 Using a helper, place the top case on your workbench with the front up. Position the bottom assembly (H/T) on the case, aligned with the back and sides. Drill mounting holes through the bottom and into *the case* [**Drawing 5**]. *Drive the screws.*

4 To install the lighting (see **Source**), route the wires from the two 12-volt light fixtures through the 3/16" holes in the cabinet top (G). Then screw-mount the lights, transformer, and wiring block to the top and make the wiring connections [**Drawing 5**], as explained in the instructions supplied with the lights.

5 Apply a small bead of clear silicone caulk along the groove in each of the two shelf edging pieces (CC). Then position each piece on the front edge of a glass shelf with the glass tight against the top of the groove. Let the caulk cure for 24 hours.

6 Rehinge the doors to the bottom case. Then remount the roller-catch hardware. Now mark and drill pilot holes and mount a classic pendant brass pull to the inner stile (W) of each door [**Drawing 8b**], using the screws supplied with the pulls.

7 Move the cases to the desired room location. Place the top case on the bottom case with the backs and sides aligned. From inside the bottom case, drill mounting holes and drive #6×⅝" flathead wood screws through the figure-eight fasteners into the top-case bottom (H) to secure the cases.

8 Finally, install the shelf assembly (BB/CC) in the bottom case and the two glass *shelves in the top case, where desired, using* ¼" cushioned shelf pins. Insert the lighting plug into a 120-volt outlet, and turn on the lights. Now fill the cabinet with your special glassware, art objects, and other items, and admire them and your awesome craftsmanship in a new light.

Written by **Owen Duvall** with **Jeff Mertz**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

Materials List

		FINISHED SIZE T	W	L	Matl.	Qty.
Cases						
A	bottom-case sides	¾"	20⁹⁄₁₆"	31¼"	BP	2
B	top-case sides	¾"	20⁹⁄₁₆"	42¾"	BP	2
C	bottom-case back support	¾"	31¼"	5½"	BP	1
D	top-case back support	¾"	42¾"	5½"	BP	1
E	bottom-case back	¾"	4⅞"	26½"	BP	1
F	top-case back	¾"	4⅞"	42"	BP	1
G*	cabinet bottom/top	¾"	15²³⁄₃₂"	32⅝"	BP	2
H*	top-case bottom	¾"	17⁷⁄₃₂"	34¼"	OP	1
Face frames						
I	bottom-case corner stiles	¾"	3¼"	31¼"	O	2
J	top-case corner stiles	¾"	3¼"	42¾"	O	2
K	bottom-case front stiles	¾"	2"	31¼"	O	2
L	top-case front stiles	¾"	2"	42¾"	O	2
M*	rails	¾"	2"	26"	O	3
Top-case interior trim						
N	rail	¾"	7"	29⅜"	O	1
O*	capitals	¾"	1½"	3¾"	O	2
P	stiles	¾"	3⅜"	34¼"	O	2
Q	keystone	¾"	2⅜"	4"	O	1
Cabinet trim						
R	bottom-case base-trim blank	¾"	4"	42"	O	1
S*	bottom-case cove-trim blank	½"	¾"	42"	O	1
T*	top-case molding blanks	¾"	¾"	42"	O	2
U	crown molding supports	¾"	1¼"	3¼"	OP	8
V	crown molding	½"	2⁹⁄₁₆"	96"	O	1
Doors (2 needed)						
W	stiles	¾"	2"	24⅜"	O	4
X	bottom rails	¾"	2"	9⅜"	O	2
Y	top rails	¾"	3"	9⅝"	O	2
Z	panels	¼"	9⅛"	21⅛"	OP	2
AA	doorstop	¾"	1"	4"	O	1
Shelf						
BB	shelf	¾"	13"	30⅞"	OP	1
CC*	shelf edging	¾"	1"	31⁹⁄₁₆"	O	3

*Parts initially cut oversize. See the instructions.

Materials key: BP–birch plywood, OP–red oak plywood, O–red oak.
Supplies: #6×⅝", #8x1¼", and #8x1½" flathead wood screws; #7x1¼" fine- and #8x1¼" coarse-thread pocket-hole screws; spray adhesive; double-faced tape; #20 biscuits; figure-eight fasteners (8); 2" wraparound hinges (2 pr.); double-roller catches with clips (2); clear silicone caulk; ¼" cushioned shelf pins (12); 3/16x13⅜x31⅛" double-strength glass (2); classic pendant brass pulls (2).
Blades and bits: Dado-blade set; top-bearing flush-trim, ⅛" and ¼" round-over, ¼" Roman ogee, and ¼" and ⅜" cove router bits; ¾" Forstner bit.

Source

Hardware and lighting: Full back-to-back wraparound hinges no. 31183, $5.99 pr. (2 pr.); double-roller catch with clips no. 29785, $3.49 per pkg. of 4 (1 pkg.); figure-eight fasteners no. 21650, $2.39 per pkg. of 8 (1 pkg.); classic pendant brass pulls no. 67520, $12.59 ea. (2); ¼" cushioned shelf pins no. 81844, $3.99 per pkg. of 16 (1 pkg.); gold low-profile xenon pocket two-light kit no. 39696, $63.99. Call or click Rockler, 800/279-4441, rockler.com.

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SHOP-TESTED TECHNIQUE

conquering crown molding

Watch a FREE 5-minute video on cutting crown molding at: woodmagazine.com/videos

It adds an elegant, regal look to projects, but few things intimidate woodworkers more than cutting and installing crown molding—until now.

Crown molding proves simple to cut and install on woodworking projects once you know the correct techniques. The necessary compound cuts at every corner combine a miter cut with a bevel cut, all of which can be machined on your mitersaw set up with an auxiliary fence, table, and stop assembly.

Also, wider, detailed moldings further accentuate the need for precise-fitting joints. Thankfully, there's a bag of simple tricks you can dig into. Although this article doesn't delve specifically into installing crown molding in a home, the cutting techniques work equally well for both applications.

Let your mitersaw show its stuff for this job

The key to working with crown molding lies in an accurate mitersaw with a quality blade. Although you can cut compound angles on your tablesaw by tilting the blade and angling your miter gauge, it's much simpler to use a mitersaw. And, by using our technique—cutting molding in its spring-angle position (see sidebar on *next page*) and upside down—you don't even need a compound mitersaw.

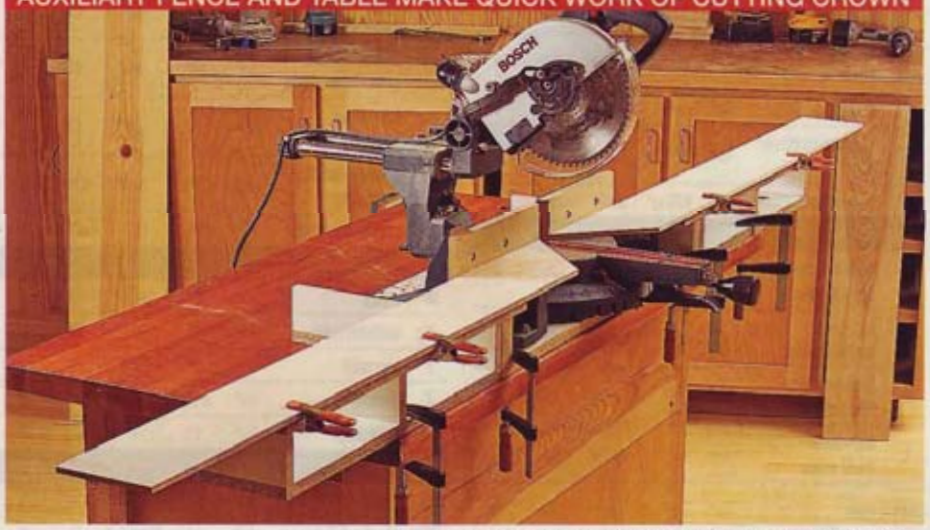
The accuracy of your cuts results directly from your mitersaw, but the finish and quality of those cuts fall directly on the blade you use. For best results when cutting any type of molding, apply the following guidelines: Use an 80-tooth carbide blade for 10" saws, and a 90- to 100-tooth blade for 12" saws. They'll cost $80–$250 apiece, but the payback in splinter-free precision makes the investment worthwhile. The teeth should have a hook angle between 5° and –5°.

Next, ensure that your mitersaw's bevel angle is 0°—with the blade perpendicular to the table. Check this with a square. Then, with countersunk carriage bolts, attach an auxiliary fence as long as the saw's fence, made of ½" MDF or plywood. Make the fence as tall as possible, without impeding the saw's ability to cut at full-depth. It provides backside support to help prevent tear-out, as well as a consistent fence height the length of the table. (See photo *below*.)

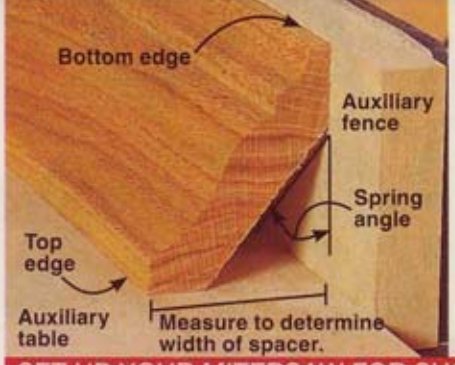
Cutting crown works best when you've got table extensions to support the molding and hold it level, a necessity for accurate cuts. We used the mitersaw extensions from issue 171 (September 2006, pages 70–73, or for sale at woodmagazine.com/extensions) with ½" plywood clamped across the saw's table.

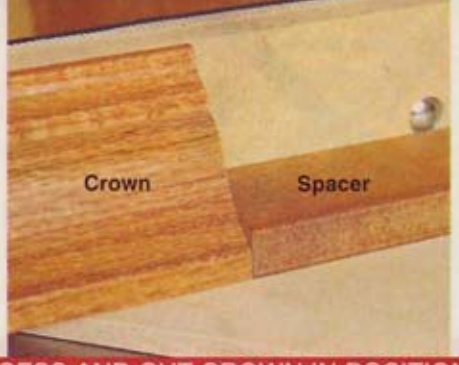
Now add the stop that will hold the crown at the correct spring angle. First, cut a 6"-long piece of your molding and rest it on the aux-

AUXILIARY FENCE AND TABLE MAKE QUICK WORK OF CUTTING CROWN



Using an auxiliary fence and extension table, made from plywood or MDF, to support your molding eliminates tipping of long moldings and enables you to produce accurate cuts.





SET UP YOUR MITERSAW FOR SUCCESS AND CUT CROWN IN POSITION

Place a short length of crown in this position—upside down and at the spring angle—to automatically set the bevel angle.

Cut a spacer that's flush with the front of the crown's inverted top edge when the molding is positioned at the spring angle.

Place the molding stop against the spacer, and screw it to the auxiliary table with 1" brass flathead screws.

How to know your molding's spring angle

When crown molding is positioned as it will appear on a project, the angle between the molding's back face and the project face is known as the spring angle. Store-bought molding will have a spring angle of 38°, 45°, or 52°. The most detailed portion of the molding's face will always be at the bottom. It is not necessary, however, to know the spring angle to use this technique.

iliary table with the bottom edge against the fence (remember, you cut crown upside down), as shown *above*. Measure from the auxiliary fence to the edge of the molding that's farthest from the fence, and then cut a spacer from MDF or plywood to match that width, as shown *above center*. Screw a 2" wide stop to the auxiliary table while sandwiching that spacer between the auxiliary fence and stop, as shown *above right*. Set your mitersaw at 45° on each side and cut through the auxiliary fence and table. (You will need to adjust the position of the stop for different-size moldings.)

Cut moldings to fit specific locations in a mitered joint

For every mitered corner, you'll need to understand the elements: There are inside and outside corners, and left and right parts for each. Think in terms of a room in a house: Inside corners are the four typical corners that define a square or rectangular room, while outside corners are those on protruding closets, for example. You'll cut the mating parts of a joint on opposing sides of the mitersaw, as shown *below*. (Inside corners, although rare for woodworking projects, prove best if done with mitered cuts rather than coping one end to match the profile on another.)

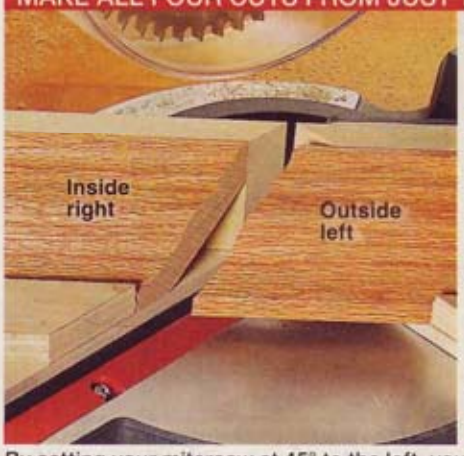
To cut a piece of molding, first cut one of the mitered ends as needed. In most instances you'll measure the length for the next cut along the bottom—or short—edge of the molding. This proves difficult when trying to catch a measuring tape's hook on the miter. Instead, use the auxiliary fence to help with measuring, as shown at *right*.

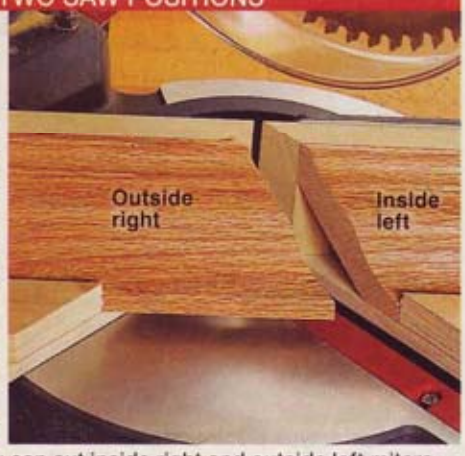
Attach crown in place with handy support blocks

Wrapping crown molding around a woodworking project always centers around tight-fitting joints. To achieve this, either assemble the mating pieces to each other directly on the project, or assemble them in a glue-up jig made to ensure squareness and attach the assembly after the glue dries. Either way yields great results. (As with all woodworking assemblies, check your joints in a dry fit on the project before reaching for glue and fasteners.)

You can assemble the crown molding in place on the corner cabinet on *page 43* because of the glue blocks mounted to the cabinet top and then hidden from view by the crown. To do this, first make the glue blocks from ¾" plywood or hardwood. (See the glue block illustration on *page 45*.) Hold a piece of your molding in position to obtain the spring angle for the glue blocks, as shown on the *next page*. Then machine the blocks on your mitersaw, alternately cutting the spring angle and 90° cutoff from a long blank rather than

MAKE ALL FOUR CUTS FROM JUST TWO SAW POSITIONS





By setting your mitersaw at 45° to the left, you can cut inside right and outside left miters. Switch your saw to 45° on the right side and you can cut outside right and inside left miters.

MEASURE AND MARK MITERS WITH MINIMAL FUSS

Measure mitered crown to length by aligning the bottom of the miter with the fence end; then hook a tape onto the fence.

CUSTOM-MADE GLUE BLOCKS ELIMINATE THE NEED FOR NAILS

Use a sliding bevel gauge to determine the spring angle for your crown molding; then transfer that angle to your mitersaw.

With the front molding dry-clamped, hold your side moldings in place and make a mark flush with the back of the cabinet.

Use clamps to hold the crown molding to the cabinet, and apply painter's tape to help draw the miters tight.

cutting the spring angle onto blocks precut to length, which would place your fingers dangerously close to the blade. Attach the glue blocks to the cabinet with glue and screws.

When cutting any molding on a mitersaw, always plunge through the cut, and then let the blade stop spinning before lifting. Lifting too soon could allow the blade to catch on the molding and damage it, or it could forcefully eject the cutoff.

For the corner cabinet, you'll need three pieces of crown: right, front, and left—with all miters cut at 22½°. For the best grain match, cut the pieces in order, with as little waste as possible between the miters. Cut the right piece first, about 1' in length, with an outside right miter on the left side. Measure, mark, and cut the front piece with miters at each end, beginning with the right side. Finally, cut the left piece 1' long, with an outside left miter on its right side.

Mark the left and right moldings, as shown *above center*, and cut them to length with 90° cuts. Attach the molding with yellow glue to the glue blocks, as well as the back edge of the crown that contacts the project face, and clamp it to the glue blocks, as shown *above right*. You also can attach the molding using a brad nailer or pinner, but you'll want to fill the holes before applying a finish.

Assembling crown in a jig ensures square corners

Assembling crown molding directly on a project can be difficult when not using hidden glue blocks or when clamping proves nearly impossible (such as a solid top with no cleats for clamping). For these situations preassemble your molding in a jig that guarantees square results. Cut your moldings to the exact lengths needed, and then build a simple jig of cleats attached to a piece of plywood, as shown *below left*. Space the cleats to match the exact dimensions of your project and, after a dry fit, attach them to the base exactly 90° to each other.

Save money by doing your own dentil work

The same techniques apply when cutting and assembling repeat-pattern moldings such as dentil or egg-and-dart crown. The trickiest part: cutting symmetrical miters. Because these detailed moldings are so costly (typically $8 or more per linear foot, about three times that of regular crown), we use prototypes cut from inexpensive crown molding with the same spring angle.

First, cut a prototype of the front or primary molding to the exact length with the correct compound miters. Next, lay the test piece on top of the dentil molding, as shown *below center*, with the bottom edges resting against a straight board. Center the top piece by eyeballing where it crosses the dentils at each end. Cut a little longer than each mark and check the length on the project to avoid cutting too short. Sneak up on the final length with light cuts at each end. (At $8 a foot, it pays to be cautious.) Once you've cut your front piece, start with a miter on the sides that mirrors those on the front, as shown *below right*. Cut to length.

Don't bother with crown molding jigs

With at least a half-dozen crown molding jigs on the market, ranging in price from $20–100, we wondered how well they performed. These jigs, not to be confused with the crown stops built into some newer mitersaws, all hold crown molding at its spring angle, similar to our technique. After trying them out, we found we got equal or better results using our auxiliary fence and stop made from plywood or MDF—and for only a few bucks.

Sources:

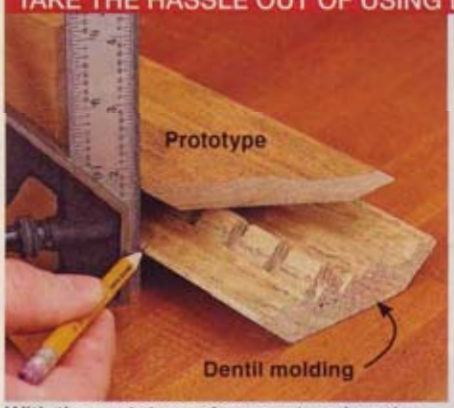
DVD: *Conquering Crown Molding*, $50, garymkatz.com.
Clamps: Collins Spring Clamps, $12 (pack of 4); Collins Spring Clamp Pliers, $15, Hartville Tool, 800/345-2396, hartvilletool.com.

Written by **Bob Hunter** with **Jeff Mertz** and **Gary Katz**

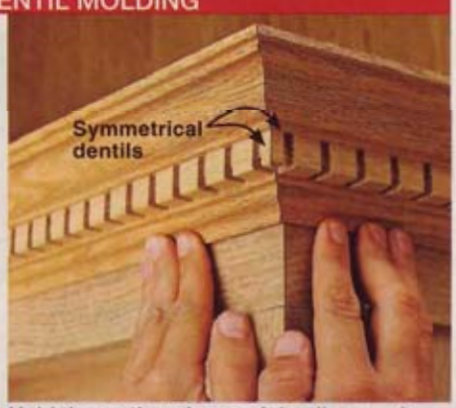
JIG HELPS YOU GET IT SQUARE

Assemble the moldings with PVA glue, holding the miters tight and square with spring clamps at the outside corners.

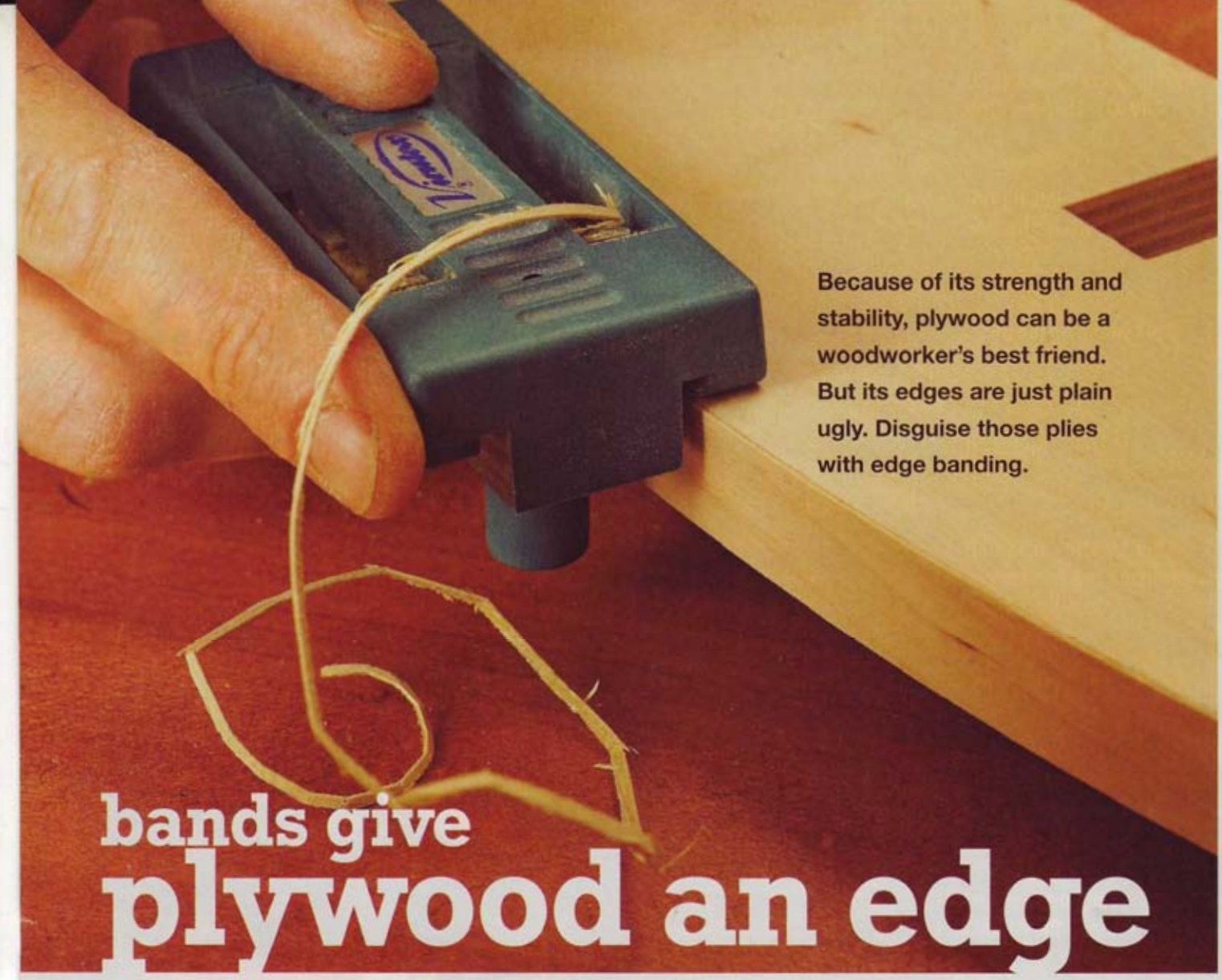
TAKE THE HASSLE OUT OF USING DENTIL MOLDING



With the prototype piece centered on the dentil molding, use a square to transfer the bottom corner mark for cutting.



Hold the mating pieces of dentil crown in place on the project and cut them so their miters are symmetrical.



Because of its strength and stability, plywood can be a woodworker's best friend. But its edges are just plain ugly. Disguise those plies with edge banding.

bands give plywood an edge

Watch a FREE 6-minute video on applying edge-banding at: woodmagazine.com/videos

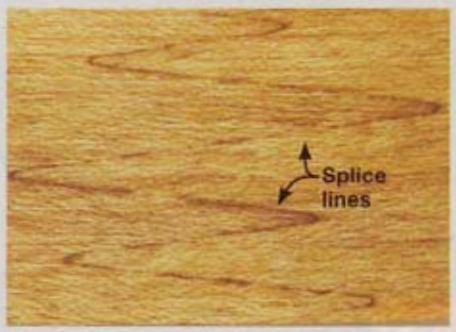
Installing adhesive-backed veneer or polyester edge banding requires only a steam iron for heat and simple trimming tools, making it ideal for the plywood shelf on *page 28*. Durable, heat-activated edge banding comes in most wood species, as shown at *left*, and in black, gray, almond, and white polyester. Common widths of 13/16", 1", 1½", and 2" cover most plywood and face-veneer panel edges with enough extra to leave a 1/16" overhang on both sides.

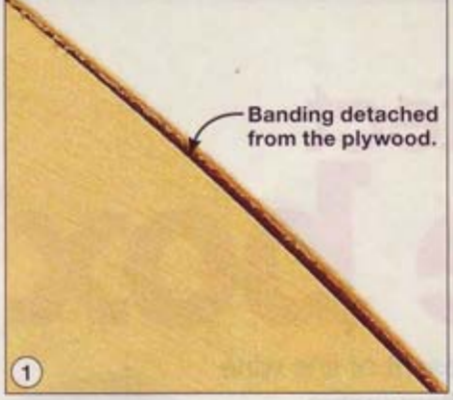
In addition to the steam iron, you'll need a tool to cut the edge banding flush with the plywood faces. A 1"-wide chisel will do, but a $10 edge trimmer, shown *above*, speeds up the job. Other tools include a utility knife with a fresh blade, a sanding block, and a screwdriver with a round shaft to use as a burnishing tool. You also can make a burnisher from scrap with rounded edges.

First, iron on the band

Start with smooth, dust-free plywood edges. If you'll cover more than one edge on a workpiece, band the other edges before banding the most conspicuous edge to hide band ends on the adjoining surfaces.

Preheat your iron to the "cotton" setting. While it's heating, use scissors to cut a strip of edge banding at least 1/8" wider and 1" longer than the edge you'll cover. As you measure each strip, check for splices like the one shown *below* that turn short wood veneer strips into long rolls of edge banding. The splices may disappear if you don't stain the edging, depending on the grain pattern





around the joint. However, stain can call attention to splices. In that case, cut edge banding strips to eliminate the splices.

For edging shapes other than circles (we'll explain those later), center the banding on the edge to be covered, leaving a ½" overhang on each end. Starting at one end, use the iron to heat the veneer and press it firmly against the plywood edge.

Work slowly enough to evenly melt the glue, but avoid overheating the glue and forcing it out at the edges. Also, watch for spots where the glue wasn't warmed enough to melt. This allows the veneer to pull away from the plywood, as shown (1).

While the glue is warm, use a burnishing tool to gently press down the banding where it meets the face veneer, as shown (2). Avoid pressing too hard or you'll split the veneer. Allow about 10 minutes for the surface to cool. Then hold the iron at an angle as shown (3), and press the veneer against each edge of the plywood to help it connect with the face veneer. Again, press gently to avoid splitting the banding, and allow the glue to cool and reharden for 10 minutes before trimming away the excess.

Now, trim off the excess

Start by trimming away the surplus banding on both ends of the workpiece. An end trimmer like the one shown (4) (see **Sources**) leaves the banding end flush with the end of the plywood on 90° corners. Where edges come together at a different angle, as on the shelf on *page 28*, trim off the end using a utility knife, a shown (5). This leaves a small lip at the edge that you'll sand off.

Check the flow of the grain on the edging before you trim it flush with the faces. If the grain veers down, as shown (6), trim from right to left. If the grain veers up as you look at the banding from left to right, trim from left to right. Otherwise, you risk splitting the edge banding as the grain pulls the trimmer down onto the plywood face.

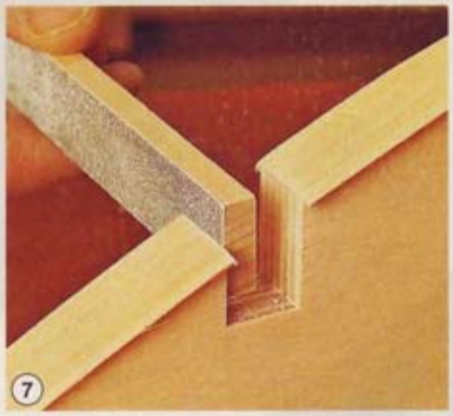
Lay the trimmer on the plywood face, and cut one edge at a time. Double-sided trimmers that cut both sides at once can dig into wood edge banding if one side moves against the grain. Save those for polyester banding and use a single trimmer on wood.

With all edges and ends trimmed, carefully hand-sand the plywood faces to remove any edging that stands proud of the faces or edges. While sanding the plywood faces, apply pressure that forces the edging against the plywood rather than pulling it away. Avoid tilting the sanding pad along the edge and cutting through both the edge banding and face veneer to expose the plywood underneath. For odd angles, such as on the shelf notch shown (7), use narrow scrap and adhesive-backed sandpaper.

Sources

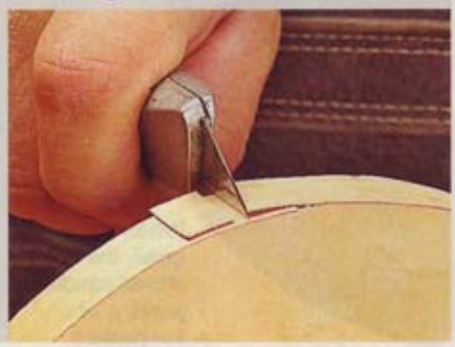
Wood veneer and polyester heat-set edge banding: Woodcraft, 800/225-1153 or woodcraft.com; Rockler, 800/279-4441 or rockler.com; Woodworker's Supply, 800/645-9292 or woodworker.com.

Banding edge and end trimmers: Band-It Edge Trimmer (no. 129119), $10 from Woodcraft. Single-edge trimmer no. 92023, $11 from Rockler. Double-sided edge trimmer no. 99K40.01 ($15) and end trimmer no. 99K40.05 ($34.50), Lee Valley, 800/871-8158 or leevalley.com.



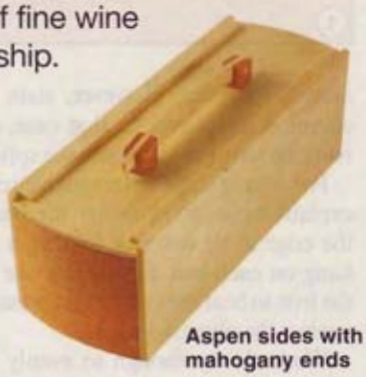
Going in circles with edge bands

To edge-band a circular workpiece, such as a round tabletop, follow the earlier instructions with two exceptions. First cut the banding roughly 2" longer than the circumference of the circle. Then begin heating the glue about 1" from the starting end and stop about the same distance from the other end. Cut both pieces together using a sharp utility knife, as shown at *right*, so the ends mate. Remove the loose cut-offs. Heat both ends and press them tightly together.



gift-perfect wine box

Give a memorable present of fine wine packaged in your craftsmanship.



Aspen sides with mahogany ends

Curly maple sides with padauk ends

When the wine's gone, the box stores candles, jewelry, or keepsakes.

Looking for a project you can make quickly that's sure to delight—and impress—the lucky recipient? This is it. Thanks to straightforward rabbet-and-groove joinery, a simple jig for drilling the eye-catching doweled ends, full-size patterns for shaping the round box ends and handle, and just six parts, you can complete this beautiful holder in a couple of hours. Whether you choose your own contrasting woods or try one of the combinations shown *above*, the box will look great.

Start with the box and lid

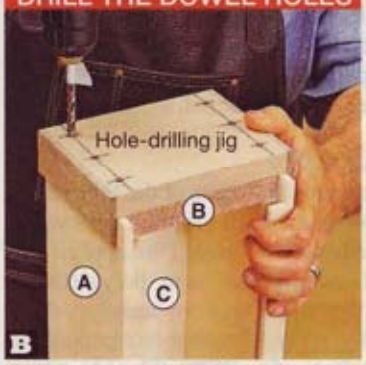
1 From ¾"-thick stock, cut the sides (A) and ends (B) to the sizes listed in the **Materials List,** except cut the sides 15½" long.

2 Using a dado blade in your tablesaw, cut a ¾" rabbet ½" deep across each end of the sides (A) on the *inside* faces to fit the

ASSEMBLE THE BOX

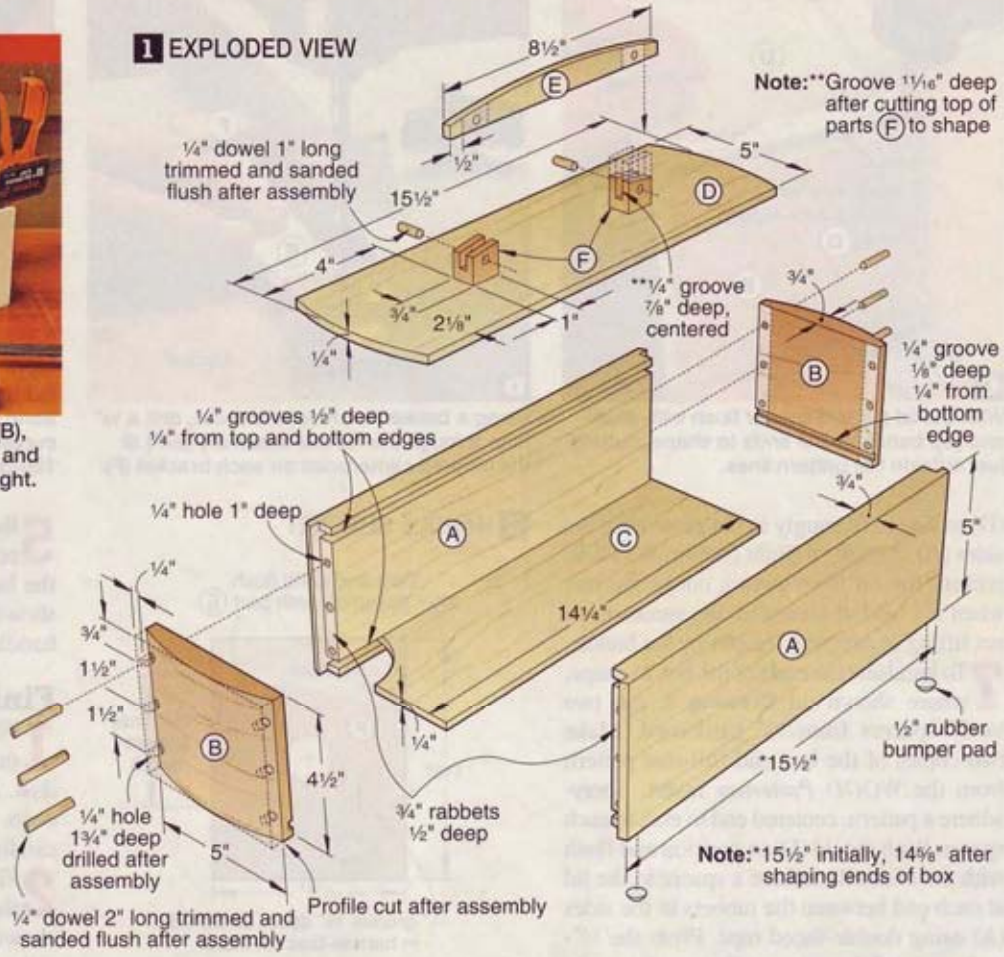
Glue and assemble the sides (A), ends (B), and bottom (C), clamping the ends first and then the sides to draw all of the joints tight.

DRILL THE DOWEL HOLES

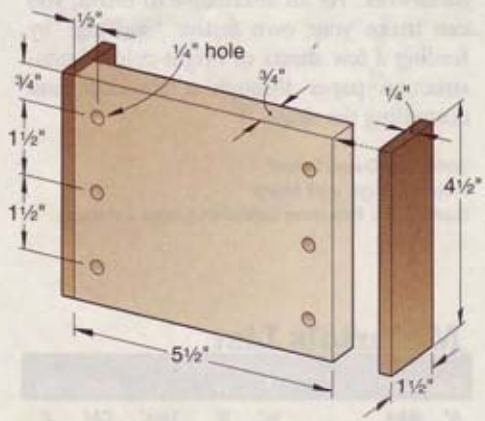


With the hole-drilling jig flush with the bottom of each end (B), drill six ¼" holes 1¾" deep into the end and sides (A) for the dowels.

1 EXPLODED VIEW



2 HOLE-DRILLING JIG



SHOP TIP

How to ensure snug-fitting dowels

Dowels can run a few thousandths of an inch larger or smaller than their specified diameter, leaving them tight or loose in the mating holes. Here's an easy way to make sure that the dowels fit snug. For a ¼" dowel, for example, drill a ¼" hole in scrap. Test-fit the dowel in the hole. **If tight**, chuck a maximum 6"-long piece of dowel in your drill. Turn the drill on, and sand the dowel evenly along the length, as shown, until you achieve the desired fit. **If loose**, drill a ¹⁵⁄₆₄" hole (¹⁄₆₄" smaller in diameter) in the scrap. Check the fit of the dowel in this hole. If snug, drill ¹⁵⁄₆₄" holes in the workpiece. If tight, sand the dowel, as before.

ends (B), where shown on **Drawing 1**. Then cut a ¼" groove ½" deep ¼" from the top and bottom edges of the sides to receive the bottom (C) and lid (D) and a ¼" groove ⅛" deep ¼" from the bottom edges of the ends on the *inside* faces (also to fit the bottom).

3 From ¾" stock resawn or planed to ¼" thick, cut the bottom (C) to size. Sand the sides (A), ends (B), and bottom to 220 grit. Now assemble the box, as shown in **Photo A**.

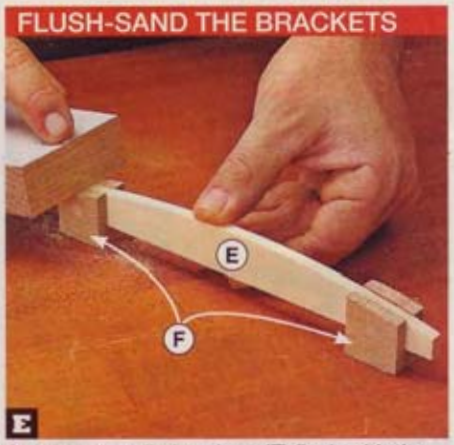
4 To drill holes to receive ¼" dowels in the ends (B), where dimensioned on **Drawing 1**, make the hole-drilling jig shown on **Drawing 2** from ¼" hardboard and ¾" scrap. To make sure that the dowels fit snugly in the holes, see the **Shop Tip**, *above*. Positioning the jig on the box, as shown in **Photo B**, drill ¼" holes 1¾" deep into each end and the sides (A). Add ¾" to the drilling depth to allow for the jig thickness, and apply masking tape to the drill bit 2½" from the tip for a visual stop.

5 Cut twelve 2"-long pieces from a ¼" birch or maple dowel. Glue and drive the dowels into the bottom of the holes in the ends. (The dowels will extend ¼" from the ends.) Let the glue dry overnight. You'll trim the dowels when bandsawing the ends.

6 From ¾" stock resawn and then planed or drum-sanded to ¼" thick, cut the lid

With the lid (D) and spacer flush with each end (B), bandsaw the ends to shape, cutting just outside the pattern lines.

Using a backer to prevent tear-out, drill a ¼" hole through the handle assembly (E/F) at the marked centerpoint on each bracket (F).



Sand the handle brackets (F) flush with the curved top edge of the handle (E) using a 120-grit sanding block.

(D) to size to fit snugly in the grooves in the sides (A). Aim for a slight friction fit to help prevent the lid from sliding out of the box when it's held at an angle. We recommend not lifting or carrying the box by the handle.

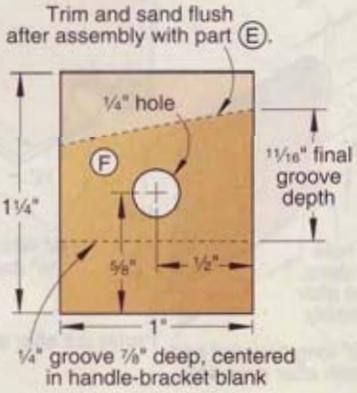
7 To bandsaw the ends of the box to shape, *where shown on* **Drawing 1**, *cut two* ¾x5" spacers from ¼" hardboard. Make two copies of the box end full-size pattern from the *WOOD Patterns*® insert. Spray-adhere a pattern, centered end to end, to each spacer. With the lid (D) in position and flush with the ends (B), adhere a spacer to the lid at each end between the rabbets in the sides (A) using double-faced tape. Press the ¼"-wide ends of the patterns that overhang the spacers to the top edges of the sides. Now, using a ⅜" blade, bandsaw the ends, as shown in **Photo C**. Sand the ends smooth using a 120-grit sanding block. Remove the spacers and patterns.

Top it off with the handle

1 From ¾" stock resawn or planed to ¼" thick, cut a 1x8½" blank for the handle (E). Photocopy the full-size handle pattern from the insert. Spray-adhere the pattern to the blank. Then bandsaw or scrollsaw and sand to the pattern line. You'll drill the ¼" holes through the handle for the dowels after gluing the handle brackets (F) to it. Remove the pattern.

2 From ¾" stock, cut a 1¼x12" blank to form the handle brackets (F). Cut a centered ¼" groove ⅞" deep along an edge of the blank, where shown on **Drawing 3**. Now crosscut two 1"-long handle brackets from the blank.

3 HANDLE BRACKET



3 Glue the handle brackets (F) to the handle (E), locating the brackets ½" from the ends of the handle, where dimensioned on **Drawing 1**. Next, mark a centerpoint on each bracket for a ¼" hole, where dimensioned on **Drawing 3**. Now, using a brad-point bit, drill the holes, as shown in **Photo D**.

4 Cut two 1"-long pieces from a ¼" birch or maple dowel. Glue the dowels, centered end to end, in the holes in the handle assembly (E/F). Let the glue dry overnight. Then trim the dowels using a flush-trim saw, and sand smooth.

5 Bandsaw or scrollsaw the handle brackets (F) close to the curved top edge of the handle (E). Sand the brackets flush, as shown in **Photo E**. Now glue and clamp the handle assembly, centered, to the lid (D).

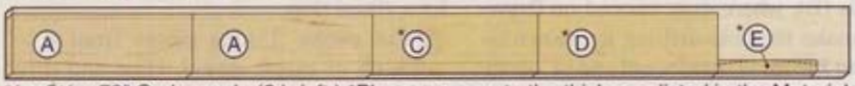
Finish up

1 Finish-sand any areas of the lid and box that need it to 220 grit, and remove the dust. Apply a clear finish. (We applied two coats of water-based satin polyurethane, sanding to 320 grit between coats.)

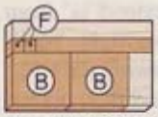
2 Finally, apply ½" rubber bumper pads to the bottom edges of the sides (A), where shown on **Drawing 1**. Now, place some decorative cushioning material, such as raffia (available at party or such crafts supply stores as Michaels), along with a fine bottled beverage in the box, slide the lid into place, and surprise someone special with your handiwork. As an alternative to raffia, you can make your own festive "stuffing" by feeding a few sheets of bright-colored construction paper through a shredder and crumpling the strips.

Written by **Owen Duvall**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

Cutting Diagram



¾ x 5½ x 72" Curly maple (3 bd. ft.) *Plane or resaw to the thickness listed in the Materials List.

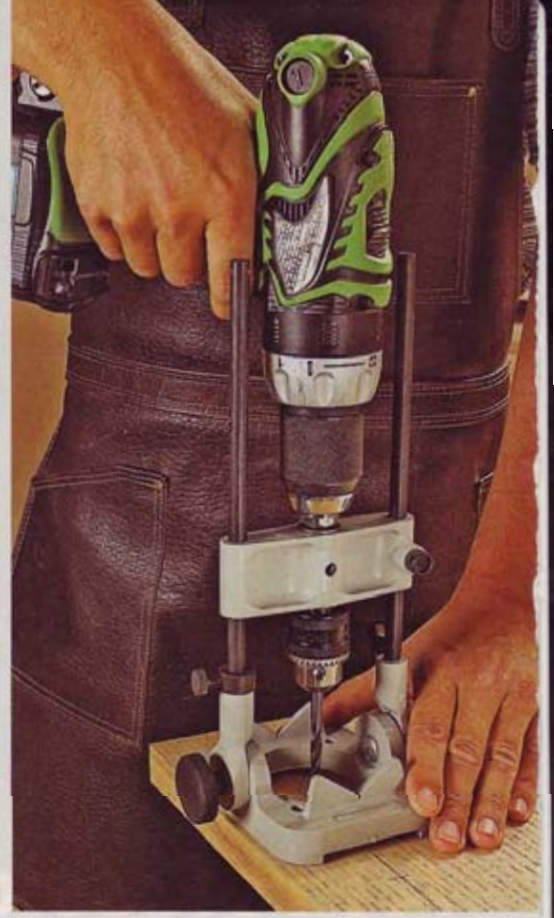


¾ x 7¼ x 12" Padauk (.7 bd. ft.)

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	sides	¾"	5"	14⅛"	CM	2
B	ends	¾"	4½"	5"	P	2
C	bottom	¼"	5"	14¼"	CM	1
D	lid	¼"	5"	15½"	CM	1
E*	handle	¼"	⅞"	8½"	CM	1
F*	handle brackets	¾"	1⅛"	1"	P	2

*Parts initially cut oversize. See the instructions.
Materials key: CM–curly maple, P–padauk.
Supplies: ¼" birch or maple dowel 36" long, spray adhesive, double-faced tape, ½" rubber bumper pads (4).
Blades and bit: Dado-blade set, ⅜" bandsaw blade, ¼" brad-point bit.



eking precision from

3 portable power tools

Discover shop-proven strategies to elevate your circ saw, jigsaw, and portable drill to the stratosphere of performance.

Many seasoned woodworkers see the tools *above* as the rough-work trio, not to be mentioned in the same breath with the word "precision." Typically, woodworkers rough-size wood materials with a circ saw and finish-cut them on a tablesaw; or they rely on their bandsaw to cut curved parts, fearing they'd hack up workpieces with a jigsaw; or they view their cordless drill as a convenience—not nearly as precise as a drill press.

But what if you don't own a tablesaw, bandsaw, or drill press? What if you don't have the extra jack to buy these stationary tools? Can you do high-quality work with the much-maligned trio? The answer: Absolutely! With the right accessories, bits, blades, and a shop-made helper or two, improved—if not flawless—precision is well within your grasp. Here's how to turn these "go-away" tools into "go-to" superstars.

Get clean, straight cuts with your circ saw

Crosscutting, ripcutting, and bevel-cutting along a straight line sum up the circ saw's role. To ensure success, equip the tool with a quality blade, matching it with the material and type of cut (see *right*) and adjusting the blade depth ⅛" below the work.

Carbide saw blade savvy

(1) If you're cutting softwood, softwood plywood, and MDF or ripcutting hardwood, a standard or thin-kerf 24-tooth, 7¼" combination blade will deliver a respectable cut. It has an aggressive 20° tooth hook and costs about $15. (2) For a fine finishing blade to cut hardwood and hardwood veneer plywood, pay a few bucks more for a 40-tooth, hard-body, thin-kerf blade. Costing around $30, its 12° tooth angle cuts less aggressively, leaving few splinters. (3) A standard-kerf 40-tooth blade, with its 20° tooth hook, delivers the cleanest cut, only at a slower rate. Price: $45.

Troubleshooting problems

Alignment woes. Do a two-step to tune up your saw for spot-on accuracy. First, square the saw's baseplate to the blade. With the tool upside down (and unplugged), loosen the blade-depth lock. Lower the blade and lock it into place. Then retract the blade guard. Fit a square snugly against the blade body and baseplate sole (A). Adjust and lock the baseplate to square.

Also, using an adjustable square, check if the baseplate edge is parallel to the blade (B). If you detect a difference from the front to back, adjust the baseplate of your saw. If you can't, add a shop-made zero-clearance subbase discussed under **Splintering and tear-out.**

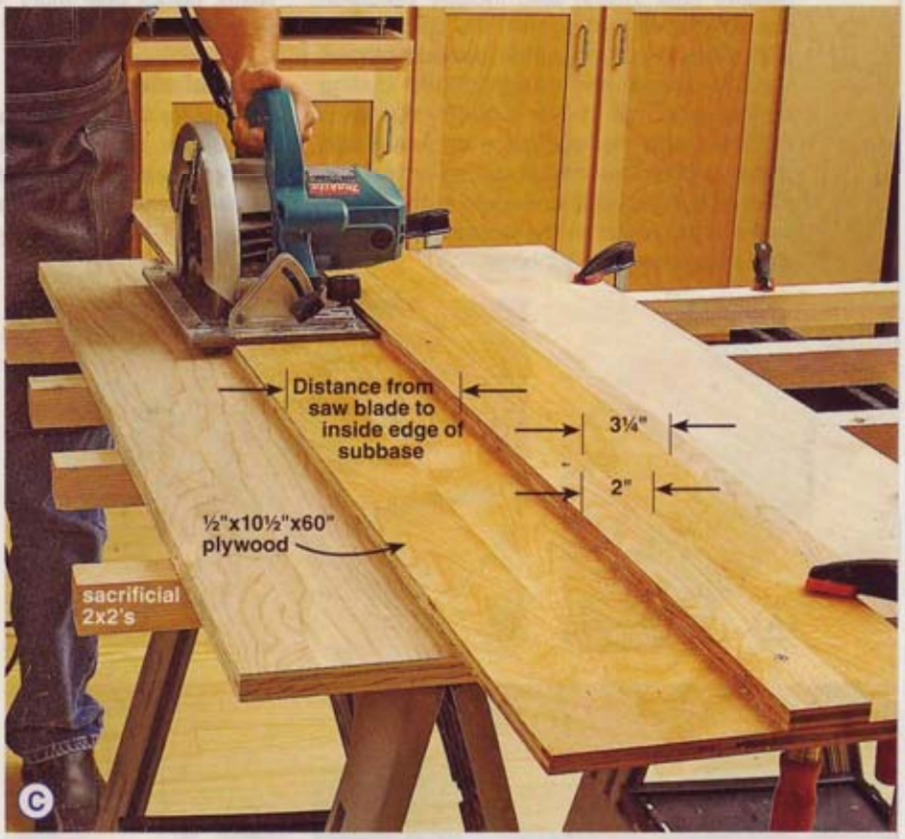
Finally, using a drafting triangle, check the calibrations on the blade-angle scale at 30° and 45°. If your scale is off, incise these intersections with a sharp blade or nail for speedy reference later.

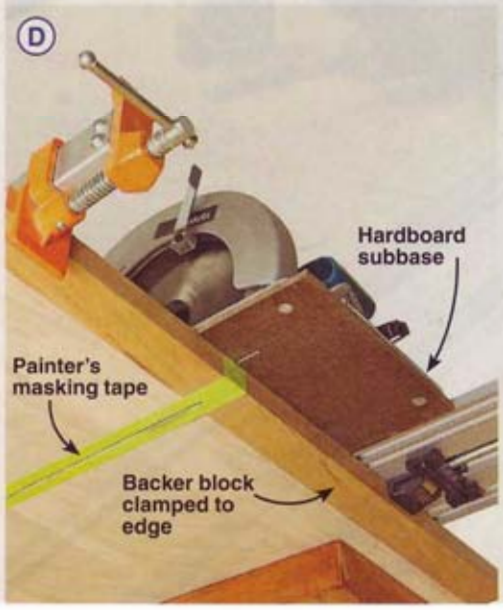
Kickback and wavering cuts. It's scary when a circ saw jumps back during a cut. You fear injury and chewing up the workpiece. Many factors lead to kickback: a lack of stock support, which causes the material surrounding the saw to bind the blade; a forced feed rate; or a hung-up cord. As shown (C), it pays to equally support material on both sides of the cutline and—if needed—clamp the workpiece down to prevent it from moving when sawing. Using sawhorses and sacrificial 2×2s under the workpiece provides a cheap solution. Also, don't force the saw; you'll know when the motor slows. And drape the cord over your shoulder so it doesn't catch and yank the saw off course.

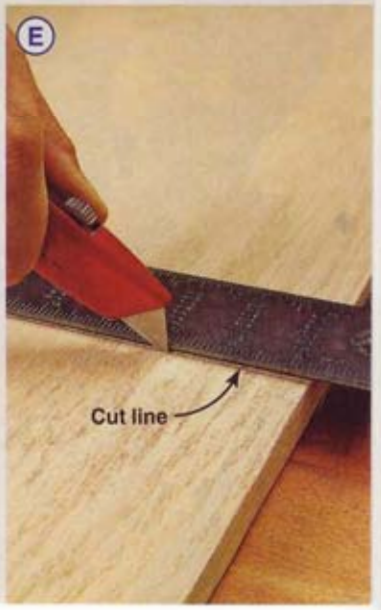
To correct wavering or binding freehand cuts, make a straightedge guide customized to your saw like the one at *right*. Another option: Buy a clamp-on tool guide with a circ saw subbase as shown *previous page, top left*. Such systems prevent the tool from straying from the cutline. (See other guides in *WOOD*® magazine issue 165, page 72, or at woodmagazine.com/toolguides.)

Splintering and tear-out. Unlike a tablesaw blade, the teeth of a circ saw blade cut from the bottom up, so it's the top face of a workpiece where splintering typically occurs. For this reason, place the good face of your workpiece down. Tear-out occurs when the blade exits the edge of the workpiece, creating large splinters. Several strategies can eliminate these problems (D). Beyond adding a sharp blade, they include pressing masking tape over the cutline; securing a scrap backer block where the saw blade exits the work; and attaching a zero-clearance, ¼"-thick hardboard subbase to the saw's sole, ensuring that the subbase edges parallel the blade.

When sizing the subbase, make it the same length as your tool's sole, but make the width equal to the distance from the blade-side edge of the sole to the outside edge of the motor (to keep the motor from bumping clamps or hitting the straightedge during a cut). Better still, make the width between the blade and subbase edge a whole number, such as 6", and you'll save time setting up for a cut by not having to deal with fractions. Once you've cut the subbase, secure it with countersunk screws, washers, and nuts, or cloth-backed double-faced tape. Another strategy: Score the cutline with a knife (E).





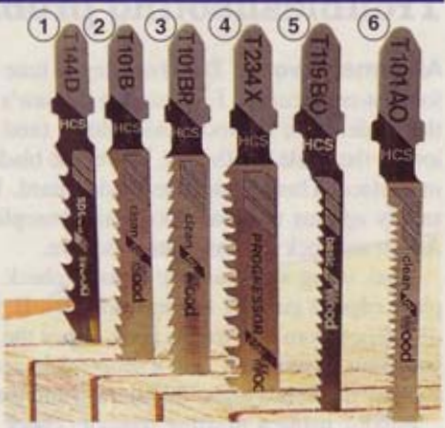


Make your jigsaw a curve-cutting specialist

You can't make a good cut with a cheap, down-and-dirty jigsaw, regardless of blade style or quality. A good tool features guide rollers behind the blade to provide support and keep it from deflecting. Some Bosch jigsaws (see *above*) also include precision control guides that contain the blade along both sides. A lock-on button, sawdust blower, variable speed, and straight/orbital cutting options also help deliver a quality cut when matched with the workpiece thickness and material. (The less orbital cutting action, the cleaner the cut.) Still one more feature is an anti-splinter insert in the baseplate, serving as a zero-clearance subbase.

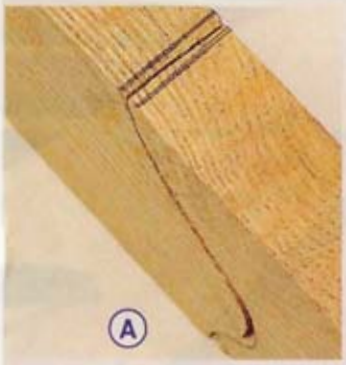
When selecting blades, choose one based on the material you intend to cut, its thickness, and the type of cut. The teeth per inch (tpi) of a wood or plywood jigsaw blade ranges from 6 tpi (coarse) to 20 tpi (fine), with 6 tpi blades being fast and aggressive. Ground, close-set teeth yield clean, precision cuts, while narrow blades excel at turning sharp corners. Rely on plunge-tip and not tapered-tip blades for—what else?—plunge cuts.

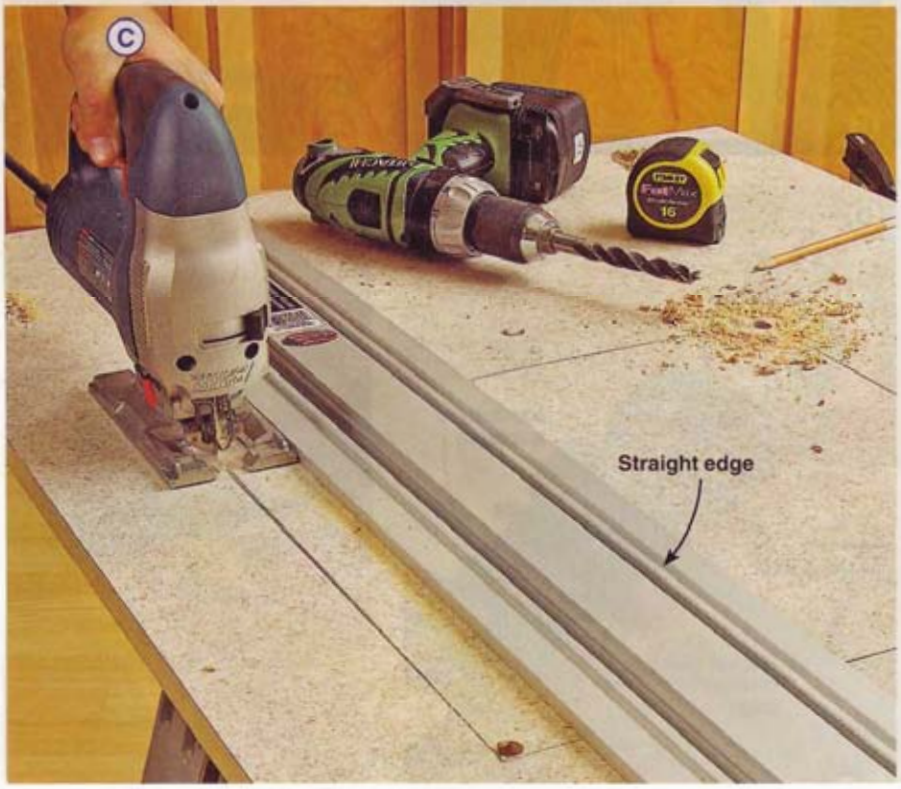
Also, expect to find two styles of upper blade ends: T-shank and U-shank. This describes the part that inserts into the tool. Of these, the T-shank blades hold more securely in jigsaws that accept them.



Best blade choices

(1) 6 tpi for fast, coarse cuts; (2) 10 tpi for straight, fine cuts; (3) 10 tpi reverse-tooth for straight, splinter-free cuts on the surface where the blade exits the workpiece; (4) progressive-tooth with graduating tpi for fast, clean cuts in thick and thin material; (5) 12 tpi for narrow, curved cuts in woods; (6) 20 tpi for fine, narrow curved cuts in woods and plastics.





Troubleshooting problems

Blade deflection and saw marks. Deflection occurs when the blade bends to the right or left of the cutline (A), leaving an unsquare edge and, in severe cases, ruining the workpiece. Saw marks leave a rough edge. Choosing the right tool and blade are part of the solution, as well as using a straightedge to guide the saw along and straight cuts. When cutting curves, stay 1/16" outside the cutline. Clean up curved cuts with a drill-press-mounted sanding drum (concave cuts) or with a disc sander (convex cuts). Or, make a hardboard template of the cut edge and use it, along with a router and flush-trim bit, to true the edge.

Splintering and tear-out. Cure these with the same techniques described on the *previous page* used to reduce splintering and tear-out with a circ saw. Score and/or tape cutlines, employ backing materials, and use a zero-clearance subbase or anti-splinter insert.

Kickback. Culprits here: binding due to a lack of stock support, wrong blade speed and feed rate, a bent blade, or a hung-up cord. Make practice cuts in scrap to determine the ideal blade speed and feed rate; then use the circ saw tips on the *previous page*.

Rough field cuts. Simple solutions apply when you cut out an opening in the middle of a workpiece. For fast plunge cuts, insert a plunge-tip blade into the jigsaw, turn on the tool, and slowly tilt the tool's blade into the waste side of the workpiece (B). For more precision, drill blade start holes at the opening corners to accommodate the jigsaw blade. Next, clamp a straightedge into place, insert the blade into a hole, and begin cutting (C).

Bore splinter-free precision holes with your portable drill

For project building, a lightweight, cordless 12- or 14.4-volt variable-speed drill with a keyless chuck provides all the torque and freedom you'll need. Having two is better, allowing you to drill pilot holes with one and drive screws with the other without the fuss of changing bits.

And while twist bits win the popularity contest in most shops, you can achieve splinter-free results, greater accuracy, and more versatility with the four choices shown at *right*. Note, too, that to maximize control, the larger the bit, the slower the speed.

Four precision bits: (1) Single-flute countersink (no. 145636, set of 4 for #4–#10 screws, $40, Woodcraft, 800/225-1153 or woodcraft.com); (2) brad-point; (3) Forstner for holes up to 1½"; and (4) Vix for self-centered holes in hinge-mouting holes, (no. and price vary, McFeely's, 800/443-7937, or mcfeelys.com).

Troubleshooting problems

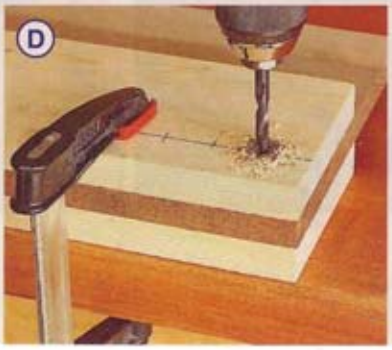
Unintentionally angled holes. To err is human, and nothing proves the point more then when trying to drill a hole at a right angle to a workpiece with a handheld drill. You can, however, reach perfection with a handheld drill using these two strategies. The simple shop-made jig (A) offers a clear view of the hole location while guiding the bit through the vertical hole in the jig's center. (You may need a drill press to drill the 90° guide hole through the jig.) Or, buy an inexpensive adjustable drill guide, *page 58, top right* (no. DG-3637, $39 at Mcfeely's). Attached to the chuck, it lets you drill 90° or angled holes, stopped holes, as well as centered holes in dowels and board edges (B) (C). Just be sure to have a firm grip on the guide's handle before aligning the bit and drilling holes.

Break-out. There's not a single good thing you can say about splinters. They're a thorn in a woodworker's... let's not go there. Speaking of backsides, backing a planned drill hole proves an effective deterrent here. To stop break-out both where the bit enters and exits, make a sandwich using scrap (D).

Inconsistent hole depths. Many people use masking tape to achieve repeatable-depth holes in wood. And although this puts you in the ballpark, it doesn't knock it out of the park if your goal is dead-on accuracy. Unfortunately, masking tape slips. Your best bet: no-mar stop collars (E). (Buy no. 908-298 for a set of 6, ⅛"-½", $25.99, Woodworker's Supply, 800/645-9292, or woodworker.com.) These secure to the bit using an allen wrench. A polymer boot at the base of the stainless steel collar prevents burning or burnishing the wood.

Bit clogging. Drilling deep holes often causes sawdust to jam the channels in a brad-point or twist bit. Carefully dig the dust jam out with a nail tip to avoid burning and polishing the hole sides, which makes them less than ideal for gluing plugs or dowels.

Written by **Jim Harrold** with **Kevin Boyle** and **Jeff Mertz**



double-duty changing table/dresser

Keep all of baby's necessities in one tidy place with this dual-function design. As your child grows, remove the changing pad and let the youngster choose drawer pulls that match his or her developing sense of style.

CONSIDER A MATCHING BED

In the previous issue (173, November 2006) we featured a complementary 3-in-1 bed. By making selected parts, you can build the crib (*right*), toddler bed (*center*), or full bed (*far right*). To order the back issue, call 800/346-9663, or go to woodmagazine.com for a downloadable plan.

AT A GLANCE

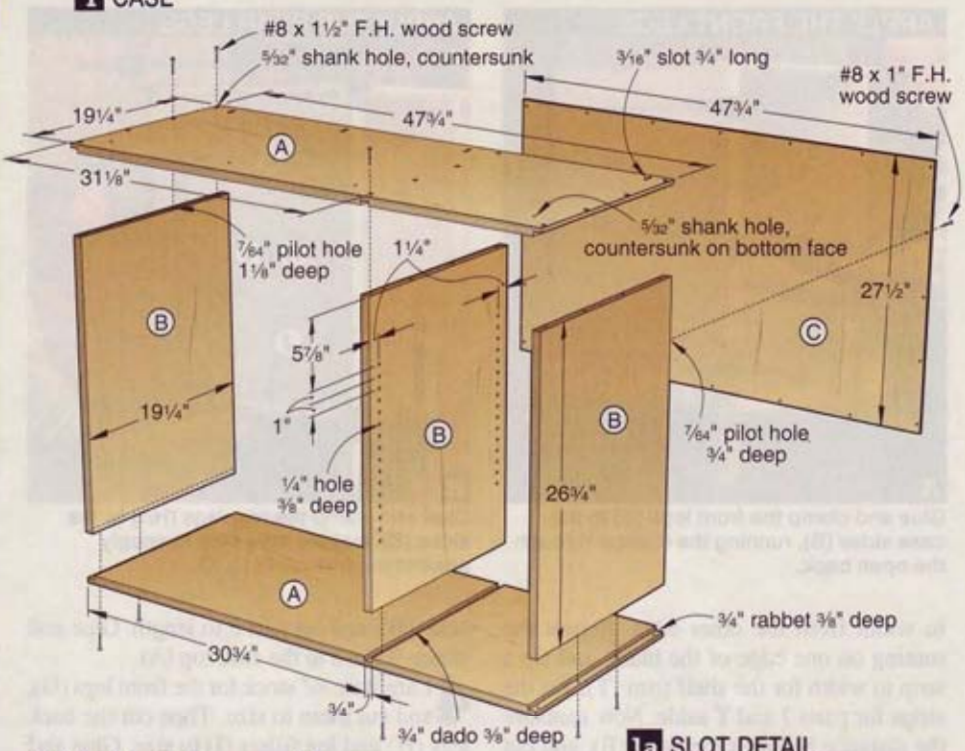
- Overall dimensions are 51¼" wide × 22" deep × 40" high.
- Toylike drawer pulls add a fun accent to the overall design. See **Source**.
- Three drawers and open adjustable shelving provide ample storage for diapers, wipes, clothing, and other needs.
- A 20½ × 51¼" dressertop provides ample room for diaper changes.
- Learn basic case construction, as well as tricks for installing drawer slides, pulls, and shelf hardware.
- For the board feet of lumber and other items needed to build this project, see *page 68*.

Build the case

1 Cut the case top and bottom (A) and sides and divider (B) to the sizes on the **Materials List** on *page 68*. Then, in the divider and right side, drill shelf support holes [**Drawing 1**]. (You can use a strip of ¼" perforated hardboard as a drilling guide.) Cut the rabbets and dadoes in the case top and bottom. Now, for later attaching the top (V) to the case, drill shank holes countersunk on the bottom face and form slots in the case top [**Drawings 1** and **1a**].

2 Glue and clamp the case in the arrangement shown [**Drawing 1**], checking it for square. Then drill screw holes through the case top and bottom (A) and into the sides and divider (B). Drive the screws. Now check the outside dimensions of the case and cut the back (C) to size and set it aside.

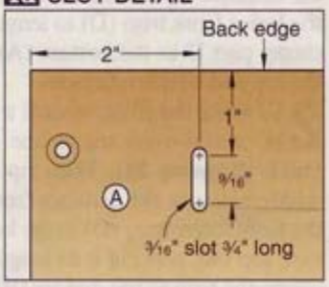
1 CASE



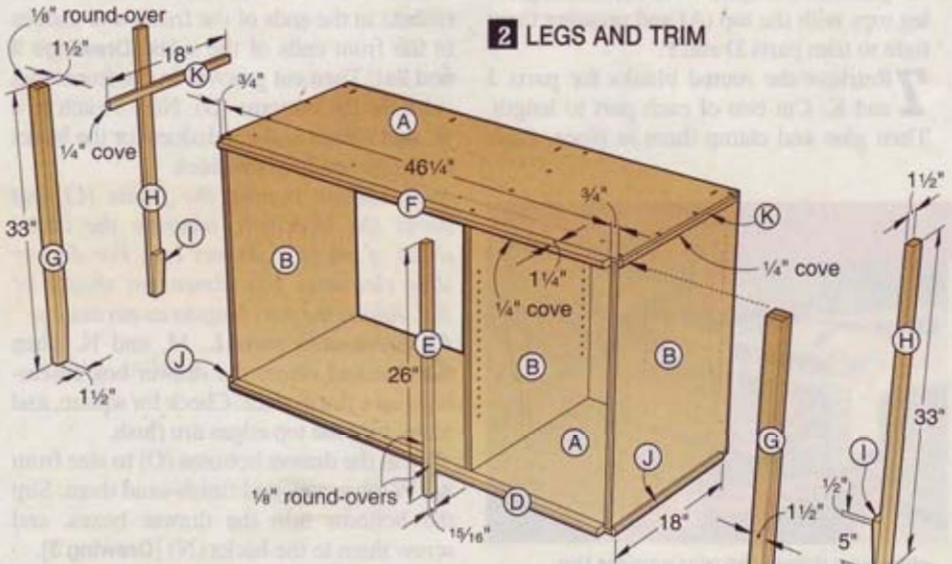
Add the trim and legs

1 For the trim parts D, E, F, J, K, and T, cut a ¾×7¼×47" blank, and plane it to the thickness of the ¾" plywood used for the case parts A and B. Then for the front lower trim (D) and side lower trim (J), chuck a ¼" round-over bit into your table-mounted router and rout the profile [**Drawing 2a**] on both edges of the blank. Next rip part D to width from one edge. Rip a strip for parts J

1a SLOT DETAIL

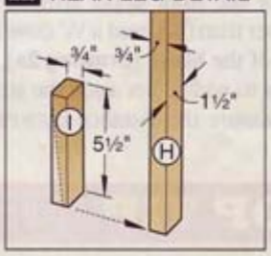


2 LEGS AND TRIM

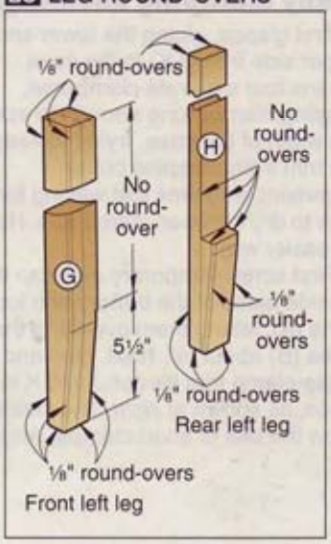


2a TRIM DETAILS

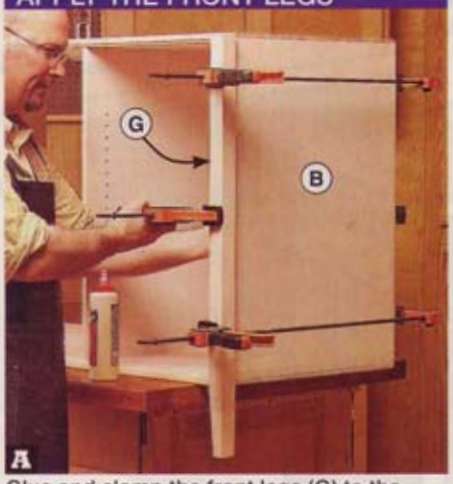
2b REAR LEG DETAIL



2c LEG ROUND-OVERS

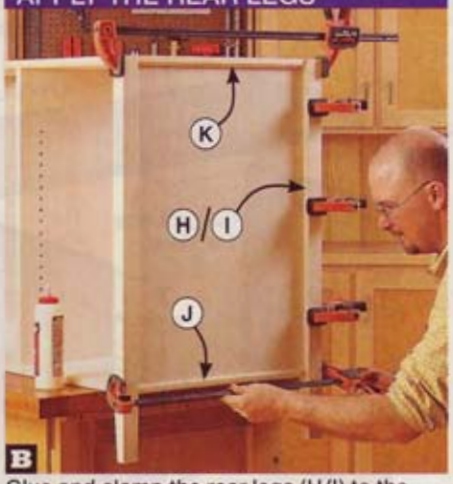


APPLY THE FRONT LEGS



Glue and clamp the front legs (G) to the case sides (B), running the clamps through the open back.

APPLY THE REAR LEGS



Glue and clamp the rear legs (H/I) to the sides (B), making sure they fit snugly against the trim parts (J, K).

INSTALL THE DRAWER SLIDES

With the drawer slide supported by spacers and aligned with the vertical line, drill pilot holes and screw the slide in place.

to width from the other edge. Repeat the routing on one edge of the blank and rip a strip to width for the shelf trim (T). Set the strips for parts J and T aside. Now measure the distance between the sides (B), and cut the lower front trim (D) to length. Glue and clamp part D to the bottom (A), flush with the top and bottom surfaces.

2 To make the front vertical trim (E), rout ⅛" round-overs along one edge of the blank [**Drawing 2a**]. Then rip the trim to width, measure the distance from the top of the front lower trim (D) to the bottom of the case top (A), and cut it to length. Glue and clamp the trim to the divider (B), flush with the side surfaces.

3 To make the front upper trim (F) and side upper trim (K), rout a ¼" cove along both edges of the blank [**Drawing 2a**]. Now rip the parts to width. Set aside the strip for parts K. Measure the distance between the sides (B), and cut part F to length. Glue and clamp it flush to the case top (A).

4 Laminate ¾" stock for the front legs (G), and cut them to size. Then cut the back legs (H) and leg fillers (I) to size. Glue and clamp the fillers to the back legs, keeping the edges and bottom ends flush [**Drawing 2b**]. Now draw the tapers on the inside faces of the legs [**Drawing 2**], and bandsaw and sand them to shape.

5 Chuck a ⅛" round-over bit into your table-mounted router, and rout the edges and bottom ends of the legs (G, H/I) where shown [**Drawing 2c**].

6 Attach the front legs (G) to the case with glue and clamps [**Photo A**], flushing the leg tops with the top (A) and pressing them tight to trim parts D and F.

7 Retrieve the routed blanks for parts J and K. Cut two of each part to length. Then glue and clamp them in place, flush with the case top and bottom and tight against the front legs (G) [**Drawing 2**]. For a surefire way to keep the parts flush at top and bottom, see the **Shop Tip** *below left.*

8 Glue and clamp the rear legs (H/I) to the sides (B) [**Photo B**]. The top of the leg fillers (I) should be tight against the case bottom and the top of the legs (H) flush with the case top. The rear legs overhang the side back edges by ¼" to conceal the edges of the back (C).

Construct the drawers

1 From ½" stock, cut the drawer fronts (L), sides (M), and backs (N) to size. With a ¼" dado blade in your tablesaw, cut rabbets in the ends of the fronts and dadoes in the front ends of the sides [**Drawings 3 and 3a**]. Then cut grooves in the fronts and sides for the bottoms (O). Now switch to a ½" dado blade and cut dadoes for the backs in the rear ends of the sides.

Note: *Before cutting the fronts (L) and backs (N) to length, measure the inside width of the case drawer bay. For drawer slide clearance this dimension should be 30". Adjust the part lengths as necessary.*

2 Finish-sand parts L, M, and N. Then glue and clamp the drawer box assemblies on a flat surface. Check for square, and make sure the top edges are flush.

3 Cut the drawer bottoms (O) to size from ¼" plywood, and finish-sand them. Slip the bottoms into the drawer boxes, and screw them to the backs (N) [**Drawing 3**].

4 From ¾" plywood, cut the drawer faces (P) to size, noting on the **Cutting Diagram** that the grain runs vertically. Finish-sand the faces.

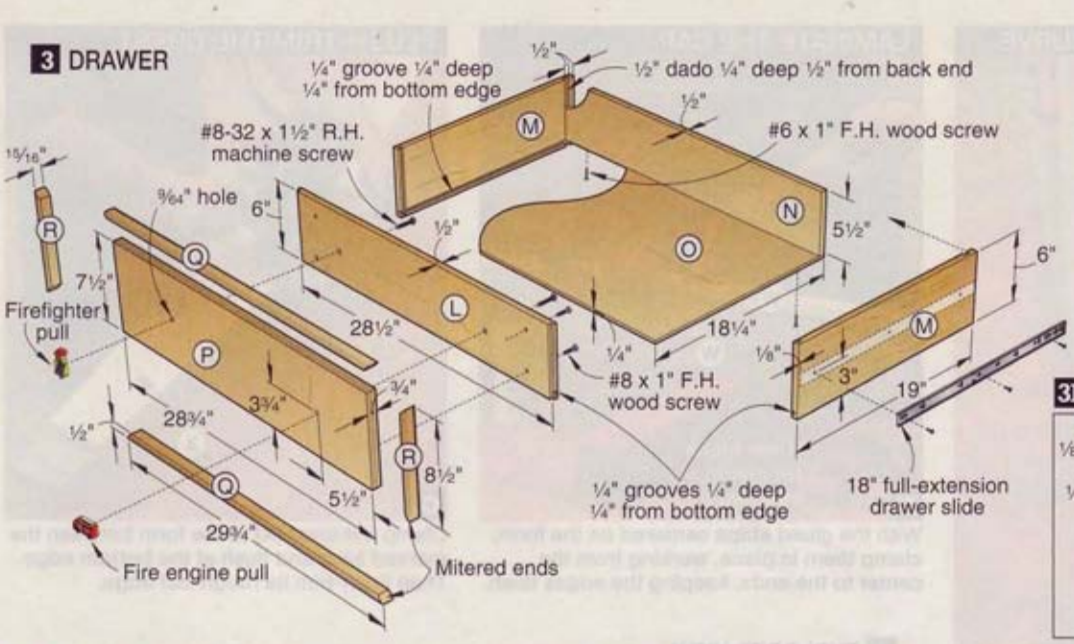
5 For the long trim (Q) and short trim (R), cut eight ½×1⅝×31" strips. Then from two of the strips, cut six 10"-long pieces for the short trim.

SHOP TIP

Temporary cleats provide many clamping advantages

At first glance, gluing the lower and upper side trim (J,K) to the case means four separate clamp-ups, juggling clamps long enough to span the width of the case, trying to keep the trim from creeping out of alignment, and time lost waiting for glue to dry between clamp-ups. Here's an easier way.

First screw temporary cleats to the outside faces of the bottom and top parts (A), letting them overhang the sides (B) about ½". Next, glue and angle-clamp trim pieces J and K in place, as shown at *right.* The cleats allow the use of short clamps. Angle-clamping draws the trim against the cleats, guaranteeing flush alignment. And because the clamping is confined to one end, you can apply all four pieces of trim in rapid succession without waiting for glue to dry. The cleat screw holes will be hidden by the top (V).



6 Miter mating ends of one long trim (Q) and one short trim (R) for each face (P). Clamp each pair of parts to a drawer face, making sure the miters are tight and aligned with the face corner. Then mark the heels of the opposite miters on each part, remove the parts, and cut the miters. Clamp these parts in place, and miter, fit, mark, and miter the remaining trim parts. Keep each set of trim with the face for which it was fitted and in the same arrangement in which it was cut.

7 Glue and clamp the long trim (Q) and short trim (R) to the drawer faces (P). Make sure all parts are flush at the back [**Drawing 3b**]. Finish-sand the trim.

Install the drawers

1 In the case drawer bay, apply masking tape from top to bottom along the inside front face of the side and divider (B). Draw a vertical line on the tape ⅛" in from the front edge of the *plywood* parts. Then mark the drawer glide centerline locations on the tape [**Drawing 4**].

2 Measure the width of a drawer slide *case* member, and subtract *half* of this dimension from the centerline dimension given for the *top* drawer slides. Cut a pair of spacers to this dimension from scrap.

3 Place the spacers against the side (B), using a small piece of double-faced tape to hold them upright. Screw the slide in place [**Photo C**]. Repeat the process for installing the top slide on the divider (B).

4 Using the method for determining spacer length for the top drawer slides, cut the spacers to length for the middle slide. Then screw the slides in place. Now cut the spacers once more and install the bottom drawer slides.

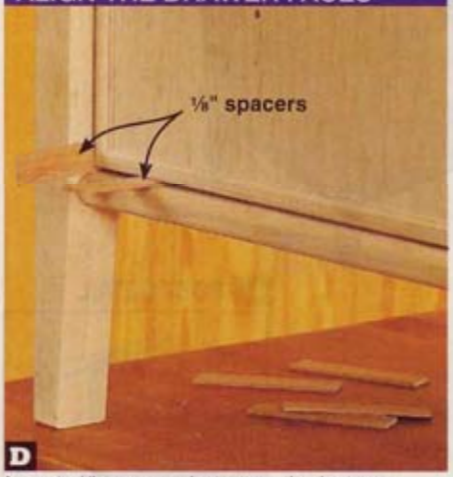
5 Measure the width of a drawer slide *drawer* member, and subtract *half* of this dimension from the slide centerline dimension shown [**Drawing 3**]. Cut a pair of spacers to this dimension. Then align the spacers with the bottom edge of the drawer side (M). Position the slide against the spacers and ⅛" from the front end of the side, drill pilot holes, and screw the slide in place. Repeat for the remaining slides. Now slide the drawer boxes into the case.

6 To align the drawer faces (P/Q/R) on the drawer boxes, first cut ⅛"-thick spacers 2" long from scrap. Then apply cloth-backed double-faced tape to the ends of the drawer box fronts (L). Adhere the bottom drawer face to the bottom box front [**Photo D**].

7 Drill holes through the drawer face (P) and drawer front (L) for the drawer pulls [**Drawing 3**]. For a quick way to drill dead-on pull holes, see the **Shop Tip** *below*.

8 Adhere the middle drawer face to the middle drawer box front, creating the

ALIGN THE DRAWER FACES



Insert ⅛" spacers between the bottom drawer face (P/Q/R) and the case bottom, side, and divider.

SHOP TIP

How to ensure matching drawer-pull hole locations

For drawers with two pulls, here's a fast way to ensure matching pull locations at opposite ends of the drawer face. Cut a piece of scrap for a template. (We used ¼" hardboard; our piece for the changing table measured 6" square.) Then drill a hole for the pull screw (or two holes for a handle-type pull) through the template at the desired location. Now hold the template against the drawer face, as shown at *right*, and drill the first pull hole through the face and drawer box. Flip the template and drill the other pull hole.

DRAW THE CAP FORM CURVE

With the curve center- and endpoints marked on a form piece, bend a fairing stick to connect the points and draw the curve.

LAMINATE THE CAP

With the glued strips centered on the form, clamp them in place, working from the center to the ends, keeping the edges flush.

FLUSH-TRIM THE CREST

Clamp the crest (X) to the form between the marked lines and flush at the bottom edge. Then flush-trim its rough-cut edge.

clearance between the bottom drawer face, side, and divider with the spacers as before. Drill the drawer-pull holes. Add the top drawer face to the top drawer box in the same manner, and drill the pull holes.

9 Carefully open each drawer and secure the drawer faces to the drawer boxes with the drawer pulls. Then remove the drawers from the case, drill pilot and shank holes through the fronts (L) and into the faces (P), and drive the screws [**Drawing 3**].

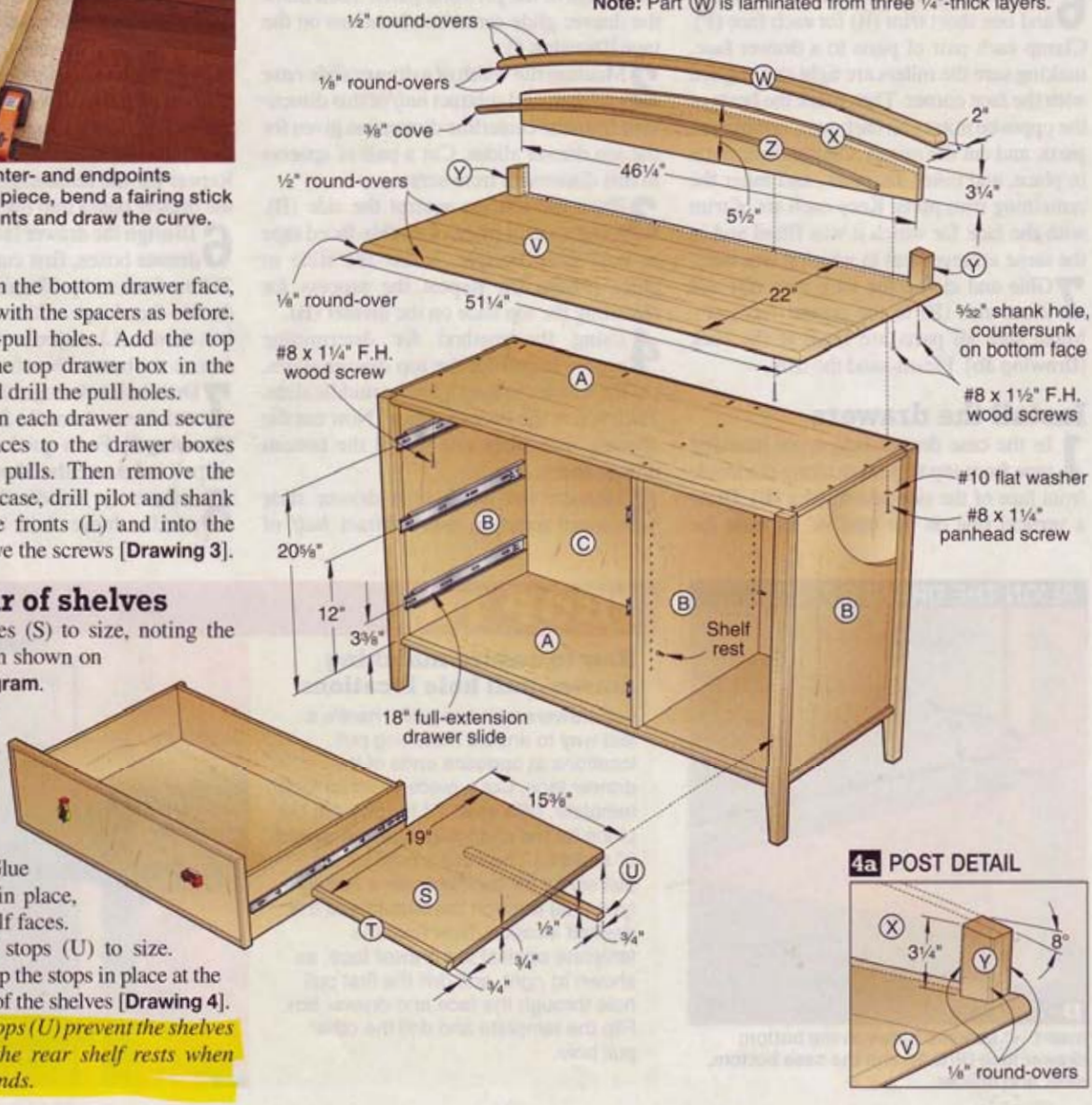
Make a pair of shelves

1 Cut the shelves (S) to size, noting the grain direction shown on the **Cutting Diagram**. Retrieve the strip cut earlier for shelf trim (T), and cut two pieces to length, matching the shelf lengths. Glue and clamp these in place, flush with the shelf faces.

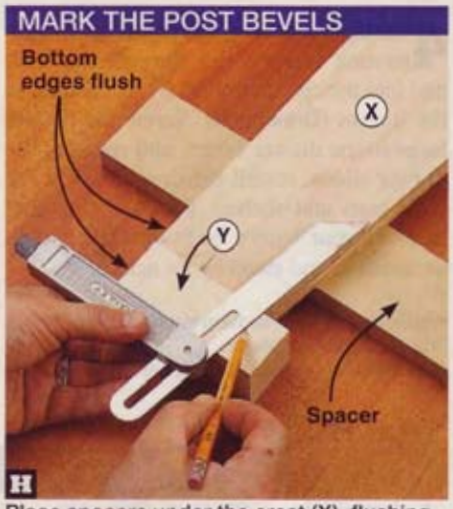
2 Cut the shelf stops (U) to size. Glue and clamp the stops in place at the bottom rear edge of the shelves [**Drawing 4**].

Note: The shelf stops (U) prevent the shelves from falling off the rear shelf rests when pulled by little hands.

4 EXPLODED VIEW

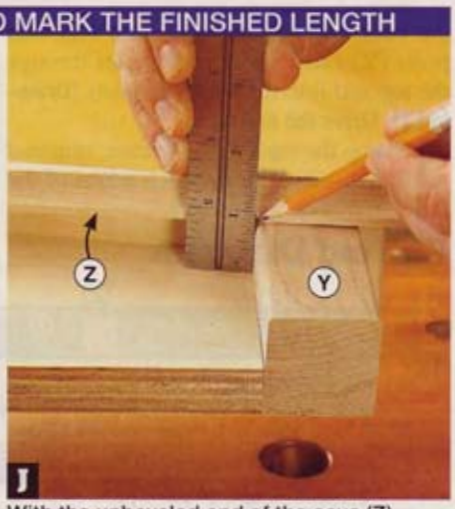


4a POST DETAIL

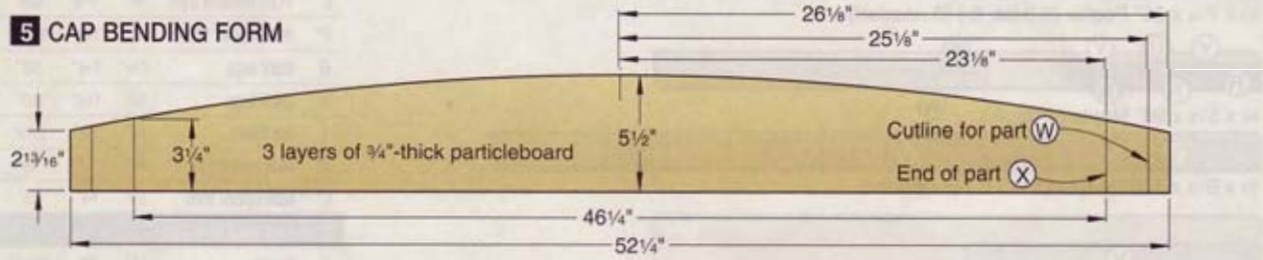


Place spacers under the crest (X), flushing it with the posts (Y). Adjust a bevel gauge to follow the crest curve, and mark the bevel.

Elevate the cove (Z) on spacers with the beveled end tight against one post (Y). Clamp the cove to the cap (W).



With the unbeveled end of the cove (Z) extending across the opposite post (Y), mark the finished length.



Add the top and crest

1 Edge-glue ¾"-thick maple to make an oversized blank for the top (V). With the glue dry, trim it to finished size. Then rout a ½" round-over along the top ends and front edge. Follow with a ⅛" round-over along the bottom ends and front edge [**Drawing 4**]. Finish-sand the top.

2 To make a form for the laminated cap (W), cut three ¾×5¾×52¼" pieces of particleboard. Then mark the center- and endpoints of the curve on one of the pieces [**Drawing 5**], and draw it [**Photo E**]. Bandsaw and sand the curve to shape. Now using this piece as a pattern, trace the curve onto the remaining form pieces and bandsaw them, staying about ⅛" outside the lines. Clamp these pieces one at a time to the pattern, flush at the straight edge and ends, and trim them to shape with a handheld router and flush-trim bit. Finally, screw the three pieces together to create the form. Mark the centerline, lines for the ends of part X, and the cutlines for part W on the form.

Note: The grain of a wood fairing stick may not be consistent, resulting in a lopsided curve. After drawing the curve, flip the fairing stick end for end to check the curve.

3 For the cap (W), resaw and plane three ¼×2¼×53" maple strips. Mark centerlines on the edges of the strips. Apply glue to the strips and clamp them to the form [**Photo F**]. Leave the cap clamped to the form for 12 hours.

4 Remove the cap (W) from the form, and transfer the centerline from the edge to the bottom face. Scrape away excess glue, and joint one edge smooth. Then plane the cap to finished width. Now clamp the cap onto the form, aligning the centerlines. Transfer the cutlines from the form to the cap, remove the cap, and cut it to length.

5 Mark ½" round-overs on the top ends of the cap (W) and ⅛" round-overs on the bottom ends [**Drawing 4**]. With the cap on edge, disc-sand the round-overs. Then chuck a ½" round-over bit into your table-mounted router. With the cap on edge, rout the top edges. Switch to a ⅛" round-over bit and rout the bottom edges. Finish-sand the cap.

6 From ¾" plywood, cut the crest (X) to size. Place it on the bending form between the marked lines and flush at the bottom edge. Trace the curve on the crest and bandsaw it ⅛" outside the line. Flush-trim the part [**Photo G**], and finish-sand it.

7 To make a blank for the posts (Y), laminate two ¾×1½×8⅛" pieces of maple, keeping the ends and edges flush. Cut the blank into two 4"-long pieces. Then mark the post bevels [**Photo H**]. Measure the bevel angle for later cutting the ends of the cove (Z). (Our angle measured 8°.) Cut the bevels. Now rout ⅛" round-overs on the post edges [**Drawing 4a**].

8 Glue and clamp a post (Y) to each end of the crest (X) with the bottom edges and back faces flush. Then glue and clamp the cap (W) onto the crest assembly (X/Y), centering it all around.

9 For the cove (Z), plane and cut a piece of maple to ½×1×50". Rout a ⅜" cove along one edge. Then rip a ½"-wide strip from the routed edge. Using the same angle for cutting the post (Y) bevels, bevel one end of the cove. Now clamp the piece in place along the cap [**Photo I**]. Mark a cutline where the trim intersects the opposite post [**Photo J**]. Bevel the cove to final length. (The end bevels are mirror opposites.) Finish-sand the cove, and glue and clamp it in place.

Apply finish and assemble

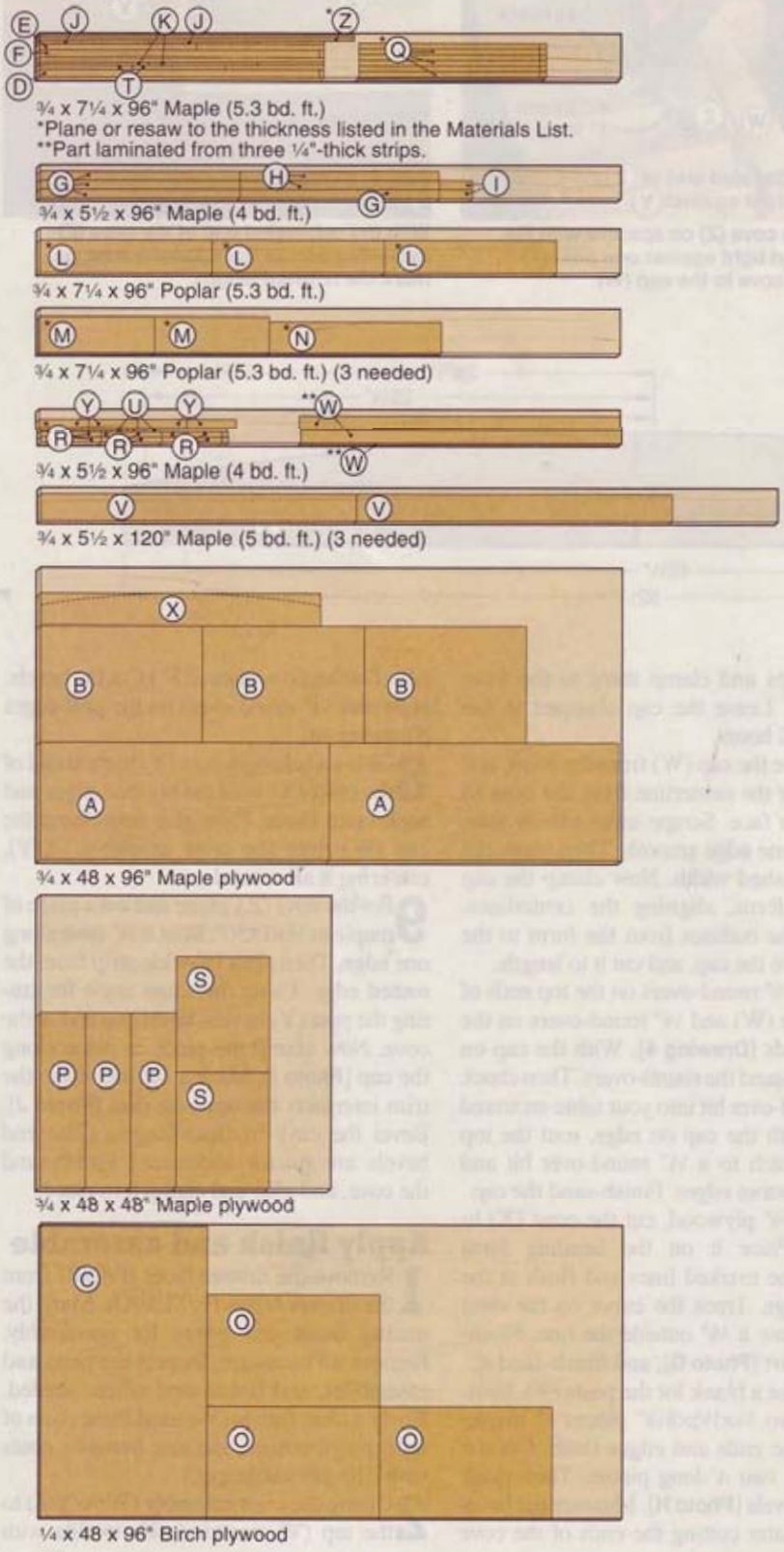
1 Remove the drawer faces (P/Q/R) from the drawer boxes (L/M/N/O). Mark the mating faces and boxes for reassembly. Remove all hardware. Inspect the parts and assemblies, and finish-sand where needed. Apply a clear finish. (We used three coats of satin polyurethane, sanding between coats with 220-grit sandpaper.)

2 Clamp the crest assembly (W/X/Y/Z) to the top (V), centered side-to-side with

the back edges of the top, crest (X), and posts (Y) flush. Drill screw holes through the top and into the crest and posts [**Drawing 4**]. Drive the screws.

3 Clamp the top (V) to the case, centered side-to-side with the back edges of the back legs and the top flush. Using the countersunk holes and centers of the slots in the case top (A) as guides, drill pilot holes into the top. Fasten the top to the case with flathead screws and panhead screws and washers [**Drawing 4**].

Cutting Diagram


E J K J Z
F Q
D T
¾ x 7¼ x 96" Maple (5.3 bd. ft.)
*Plane or resaw to the thickness listed in the Materials List.
**Part laminated from three ¼"-thick strips.
G H I G
¾ x 5½ x 96" Maple (4 bd. ft.)
L L L
¾ x 7¼ x 96" Poplar (5.3 bd. ft.)
M M N
¾ x 7¼ x 96" Poplar (5.3 bd. ft.) (3 needed)
Y U Y **W R R R **W
¾ x 5½ x 96" Maple (4 bd. ft.)
V V
¾ x 5½ x 120" Maple (5 bd. ft.) (3 needed)
X B B B A A
¾ x 48 x 96" Maple plywood
S P P P S
¾ x 48 x 48" Maple plywood
C O O O
¼ x 48 x 96" Birch plywood

4 Clamp the back (C) in place, drill countersunk screw holes through the back and into the case members (A, B), and drive the screws [**Drawing 1**]. Screw the drawer faces to the drawer boxes, and remount the drawer slides. Install the drawers. Add the shelf rests and shelves. Park the changing table in your baby's bedroom, fill it with necessities, and stand by for action.

Written by **Jan Svec** and **Jim Harrold**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

Materials List

		FINISHED SIZE T	W	L	Matl.	Qty.
Case						
A	bottom and top	¾"	19¼"	47¾"	MP	2
B	sides and divider	¾"	19¼"	26¾"	MP	3
C	back	¼"	47¾"	27½"	BP	1
D*	front lower trim	¾"	1¼"	46¼"	M	1
E*	front vertical trim	¾"	15⁄16"	26"	M	1
F*	front upper trim	¾"	1¼"	46¼"	M	1
G	front legs	1½"	1½"	33"	LM	2
H	back legs	¾"	1½"	33"	M	2
I	leg fillers	¾"	1½"	5½"	M	2
J*	side lower trim	½"	¾"	18"	M	2
K*	side upper trim	½"	¾"	18"	M	2
Drawers and shelves						
L	fronts	½"	6"	28½"	P	3
M	sides	½"	6"	19"	P	6
N	backs	½"	5½"	28½"	P	3
O	bottoms	¼"	18¼"	28½"	BP	3
P	faces	¾"	28¾"	7½"	MP	3
Q*	long trim	½"	15⁄16"	29¾"	M	6
R*	short trim	½"	15⁄16"	8½"	M	6
S	shelves	¾"	19"	15⅜"	MP	2
T*	shelf trim	¾"	¾"	15⅜"	M	2
U	shelf stops	½"	¾"	15⅜"	M	2
Top and crest						
V*	top	¾"	22"	51¼"	EM	1
W*	cap	¾"	2"	50⅞"	LM	1
X	crest	¾"	5½"	46¼"	MP	1
Y*	posts	1½"	1½"	3¼"	LM	2
Z*	cove	½"	½"	46⅝"	M	1

*Parts initially cut oversize. See the instructions.

Materials key: MP–maple plywood, BP–birch plywood, M–maple, LM–laminated maple, P–poplar, EM–edge-joined maple.

Supplies: #6x1", #8x1, #8x1¼", #8x1½" flathead wood screws, #8x1¼" panhead wood screws, #10 flat washers, #8-32x1½" roundhead machine screws.

Blade and bits: Stack dado set; ⅛", ¼", and ½" roundover, ¼" and ⅜" cove, and flush-trim router bits.

Source

Hardware. Drawer pulls: Police car no. 02A27.01, police officer no. 02A27.02, fire engine no. 02A27.03, firefighter no. 02A27.04, space shuttle no. 02A27.07, astronaut no. 02A27.08, $4.50 ea.; 18" full-extension drawer slides no. 02K42.18, $9 pr. (3 pr.); shelf rests no. 63Z06.04, $5.25 pack of 20. Lee Valley. Call 800/871-8158 or go to leevalley.com.

hot new tools for 2007

Wonder which tools will be rocking the woodworking world in the coming year? *WOOD*® magazine editors crisscrossed the country in 2006 to root out the newest, most innovative tools you'll be seeing in tool stores, catalogs, and online in 2007.

DIGITAL MITER GAUGE ALSO MEASURES BLADE BEVEL

This accessory ranked high among *WOOD* magazine staffers—especially those of us over age 40 who don't see as well as we used to. ProMiter-100's bright red LED display shines out its miter angle, as shown *above*, accurate to 0.1°. And this built-like-a-tank miter gauge has another function: With the included magnetic blade track, it also measures your tablesaw's bevel angle, as shown at *right*, helping you make compound cuts with greater confidence than ever. Inventor and cabinetmaker Mario Salazar assures us that each unit is hand-calibrated at the factory before shipping.

Price: $400
Salazar Solutions
719/337-8112, salazarsolutions.com

FOUR-IN-ONE CORDLESS DRILL DOES IT ALL

Makita's revolutionary BTP140 makes your other drills obsolete. It drills and drives, of course, but with a flick of a switch, it becomes an impact driver providing an impressive 1,240 inch-pounds of torque. Throw the switch again, and it becomes a hammer drill for boring holes into concrete. You won't even miss your corded drill: 18-volt lithium-ion batteries provide plenty of power and run time while keeping the tool's weight down to a svelte 3.9 lbs. When the batteries do run dry, it takes just 15 minutes to top off the spent cells.

Price: $470
Makita
800/462-5482, makitatools.com

ADD AN AUXILIARY FENCE FACE IN A FLASH

When we saw the Sub-Fence HoleClamps at this year's International Woodworking Fair (IWF) in Atlanta, we were surprised that no one had come up with them sooner. With these handy gadgets, you'll never have to drill into your tablesaw's fence to mount an auxiliary fence or work around interfering clamps. Drill a 7/16" hole into the top edge of your add-on fence, insert one end of the HoleClamp into the hole, and mount the fence as shown *below*. You'll find yourself using these clamps to mount stops and fence faces on your drill press and router table fences, too.

Price: $25 per pair
Mesa Vista Design
800/475-0293, grip-tite.com

GET A GRIP AND KISS YOUR CHIROPRACTOR GOODBYE

Moving sheets by yourself can be a real pain, bending over while trying to lift the sheet high enough to get a hand or hook underneath it. Once you do get hold of the sheet, you can't help but lift with your back instead of your legs. Gorilla Gripper grabs sheet goods from the top instead of the bottom, so there's no need to bend over—just flex at the knees and stand up. We like it, too, because we can now carry sheets through a doorway without doing the Chuck Berry duck-walk! It self-sizes to fit sheets up to 1⅛" thick.

Price: $50
Landon Innovations
800/423-5008, gorillagripper.com

MAGNETS TURN "ON" AND "OFF" AND HOLD FIXTURES ROCK-SOLID

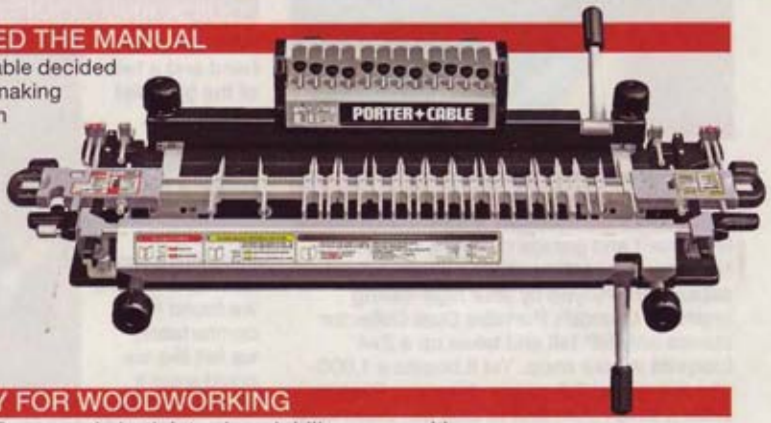
This was the hottest tool accessory we tried at this year's IWF. Turn the knob on a Magswitch in one direction, and its rare-earth magnets latch onto ferrous materials like a tick on a hound; turn the knob 180°, and they let go. You can anchor jigs temporarily to your tablesaw top with Mag-Jigs (*right*), or instantly mount a resawing fence (*below left*) to your bandsaw using the Woodworking Square, a larger device with a surprisingly tenacious grip. The Magswitch feather board, shown *below right*, has the technology built right in, so you're not limited by a miter-slot-mounted feather board. Pick up some of these handy holders, and we guarantee you'll come up with dozens of uses in your shop.

Price: Mag-Jigs, $26–$34
Woodworking Squares, $44–$99
Standard Feather Board, $39
Magswitch Technology, Inc.
303/468-0662, magswitch.com.au

DOVETAIL JOINERY SO SIMPLE, YOU MAY NOT NEED THE MANUAL

To celebrate the company's 100th anniversary, the folks at Porter-Cable decided to take the trial-and-error (and head-scratching and cursing) out of making dovetails. So they designed the new 24" Omnijig Joinery System with color-coded instructions right on the jig, and built-in depth stops for setting your router bit's cutting depth. Out of the box, the model 77240 makes through- and half-blind dovetail joints, with variable spacing for that hand-cut look. An optional mortising template expands the jig's repertoire by adding mortise-and-tenon joinery.

Price: $550; mortising template, $300
Porter-Cable
888/848-5175, porter-cable.com



FINALLY! DRILL PRESSES DESIGNED SPECIFICALLY FOR WOODWORKING

It was a long time coming, but we're thrilled to see that Delta and Powermatic both introduced drill presses with woodworker-friendly features, such as no-belt-change variable speed, a digital display that shows bit speed, laser crosshairs for spot-on accuracy (the best use for a tool-mounted laser we've run across yet), and a table that tilts 90° for end-boring.

Powermatic's 18" PM2800 comes loaded with thoughtful, practical improvements over other drill presses. For example, twin LEDs illuminate the bit from the front for shadow-free alignment on your mark. And extension tables stretch workpiece support to 26" wide. The split fence expands with the tables and includes a dust-collection port. Throw in a ⅝" keyless chuck and quill-feed handles that mount on either (or both) sides of the head, and you'll see why we like this press.

Price: $800
Powermatic
800/248-0144, powermatic.com

The speed readout on Delta's 20" 20-959LX doubles as a digital depth gauge (*above*). Touch the bit to the workpiece, zero the display, and the LCD shows boring depth in both decimal and fractional inches. The generous 14×24" table not only tilts 90° left or right, it also tilts 45° forward—a chair-maker's dream. The table also features thin edges for easy clamping, and a sacrificial MDF insert in the center.

Price: $950
Delta Machinery
800/223-7278, deltamachinery.com

THE BEST BUCK YOU'LL SPEND ON FINISHING: RIM FIN

Whether you pour paint or finish into a separate container or dip it right out of the can, at the end of the job you have to deal with a rim full of finish. Place the flexible Rim Fin in the can rim and run it all the way around the can. It sweeps the finish back into the can without a mess. More important, the lid seals better, so the finish lasts longer. It's designed for gallon cans, but we found it works just as well on quarts.

Price: $1
SMC Innovations
866/450-0200, smc-innovations.com

COMPACT CALIPER MEASURES THICKNESS IN A SNAP

Why keep a 6" caliper in your apron pocket or by your planer when you work mostly with material 1" thick or less? Carter Products' spring-loaded Snap Gauge gives you a quick reference in a flash for stock up to 1" thick. For accurate measurement, the big round jaws make it obvious when the gauge isn't sitting flat. The display reads in inches or millimeters and is accurate to within .0005". That's good enough for us.

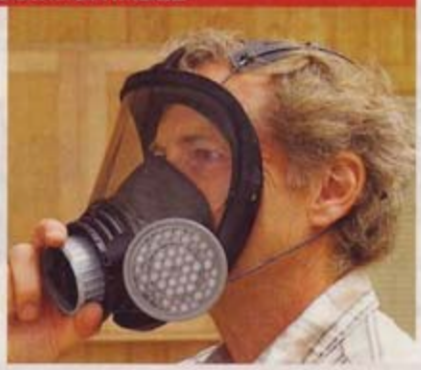
Price: $95
Carter Products
888/622-7837, carterproducts.com

THIS BANDSAW IS NEARLY SQUARE: 13" RESAW; 14" RIP

Even a typical riser-block-equipped 14" bandsaw can't resaw stock as wide as Rikon's 10-325, which bests those machines by an inch. But to make the comparison truly apples-to-apples, you'll have to figure in the standard-equipment niceties on this bandsaw: heavy cast-iron wheels, blade-tracking and -tension windows, ball-bearing blade guides, an oversize 16×20½" table, and a quick-release blade tensioner. The 10-325 is essentially a downsized version of the 18" Rikon bandsaw that earned Top Tool honors in our big-bandsaw test a year ago.

Price: $750
Rikon Power Tools
877/884-5167, rikontools.com

ONE-HANDED RESPIRATOR IS BOTH QUICK AND COMFORTABLE



With just one hand and a twist of the gray dial on the front of the mask, the AOSafety QuickFit full-face respirator snugs to an airtight fit on any beardless face. In fact, we found it so comfortable, we felt like we could wear it all day. And the contoured cradle that fits over your head eliminates the hair-snagging and nuisance of elastic straps. Pulling straight out on the grey dial releases the mask for removal. You'll never have to set down a tool or sprayer to adjust your mask again.

Price: $100
Aearo Technologies
800/225-9038, aearo.com

CYCLONE COLLECTOR FOR SHOPS WITH LOW CEILINGS

Basement and garage dwellers, rejoice! Now you, too, can have the power and debris separation enjoyed by your high-ceiling brethren. Oneida's Portable Dust Collector stands only 56" tall and takes up a 2×4' footprint in your shop. Yet it boasts a 1,000-cfm rating and 0.2-micron filtration. Casters allow it to roll from tool to tool, but depending on the size of your shop, you may just want to drag the included 15' of 5" flexible hose to the tool and park this sucker in the corner.

Price: $1,475
Oneida Air Systems
800/732-4065, oneida-air.com

AN ATTRACTIVE SOLUTION TO TOOL-TABLE TARNISHING

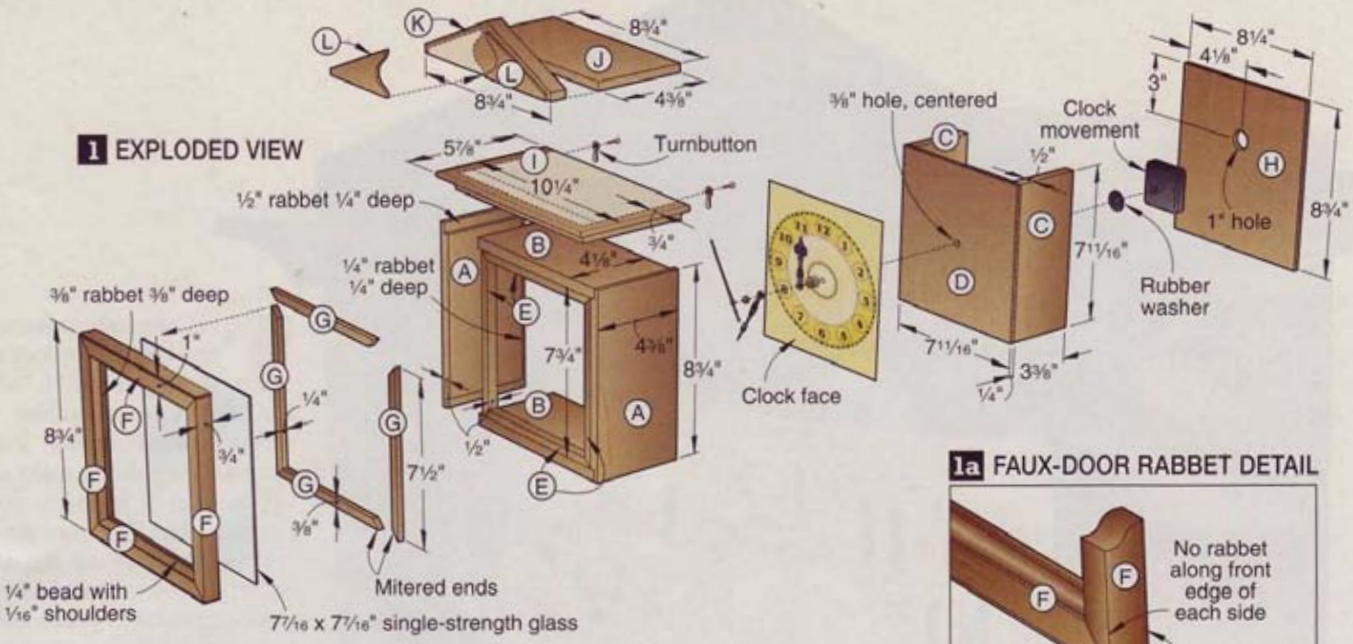
If you're short on shop space, you've probably used your tablesaw more than once as an assembly table. But a glue drip here and there can leave rust pits in the cast iron. Protect your tabletop with TOOLClad, a 28×44" roll-up magnetic sheet that resembles the world's largest refrigerator magnet. The top of the sheet is nearly covered with handy reference information, including a screw/pilot hole chart, geometric formulas, miter-gauge angle chart, and more. But there's still room for you to jot notes on it with a dry-erase marker.

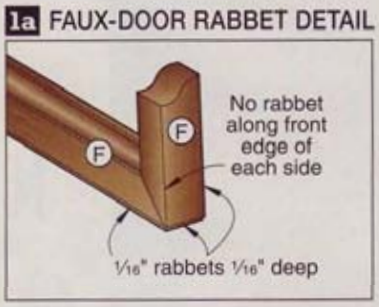
Price: $50
Modern Workbench Products
503/922-3538, toolclad.com

This elegantly ornamented timekeeper may look challenging to build, but it's not. The case assembles with straightforward rabbet joinery, and full-size patterns make shaping the peaked pediment and its onlays a snap. To create the eye-catching contour on the upper base trim, you can use a molding-plane profile bit in your router, or fashion a look-alike built-up molding using your tablesaw and router with common bits. Anxious to *start? Don't waste a second—head* for the shop!

time-honored bracket clock

Create this contemporary version of a centuries-old, English-inspired timepiece.





Start with the case

1 From ¾" stock (we used walnut) planed to ½" thick, cut the sides (A) and top and bottom (B) to the sizes listed in the **Materials List**.

2 Cut a ½" rabbet ¼" deep across each end of the sides (A) on the *inside* face, where shown on **Drawing 1**. Then cut a ¼" rabbet ¼" deep along the back edge of each side on the same face to house the back (H).

3 Glue and clamp the sides (A) and top and bottom (B) together, checking the case for square.

4 From ¾" stock planed to ½" thick, cut the clock-face sides (C) to size. Then, from ¼" walnut plywood, cut the clock-face backer (D) to size. Drill a ⅜" hole, centered, in the backer for the clock-movement shaft.

5 Glue the clock-face sides (C) to the backer (D), where shown on **Drawing 1**, flush with the edges and ends and 90° to the backer. Sand the assembly to 220 grit.

6 From ¾" stock planed to ⅜" thick, cut a ½x34" blank to form the clock-face stops (E). Then miter-cut four 7¾"-long stops from the blank to fit snugly in the case, where shown. Set the stops aside. For a pair of inexpensive, shop-built jig plans to easily cut accurate miter joints, go to woodmagazine.com/miterjig.

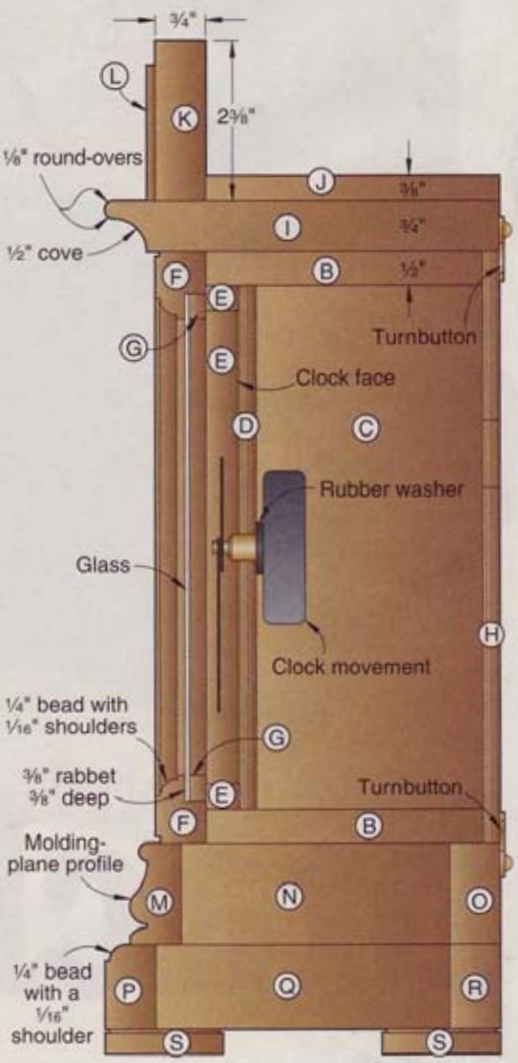
7 From ¾" stock, cut a 1x38" blank to form the faux-door sides (F). Using a ¼" beading bit in your table-mounted router, rout a ¼" bead with 1/16" shoulders along an edge on the front of the blank, where shown on **Drawing 2**. Sand the bead smooth. Then rout or cut a ⅜" rabbet ⅜" deep opposite the bead on the back to house the glass and glass stops (G). Now miter-cut four door sides to length to fit the case. (Our sides measured 8¾" long.)

8 Glue the faux-door sides (F) together, checking for square. (We used masking tape to keep the mitered corners tight.) After the glue dries, rout 1/16" rabbets 1/16" deep along the edges and corners of the door, where shown on **Drawing 1a**. (The rabbets create the appearance of door separation from the case.) Glue the door to the case, as shown in **Photo A**. Now sand the case/door assembly smooth.

9 From ¾" stock resawn or planed to ¼" thick, cut a ⅜x34" blank to form the glass stops (G). Miter-cut four 7½"-long stops from the blank to fit into the rabbeted back of the door. Sand the stops, and set them aside.

10 From ¼" plywood, cut the back (H) to size to fit the case. Using a Forstner bit and a backer to prevent tear-

Glue and clamp the faux door (F) to the case, noting the correct orientation of the rabbeted edges on the door.



out, bore a 1" hole for finger access through the back, where dimensioned on **Drawing 1**. Sand the back. Set it aside.

Head for the top

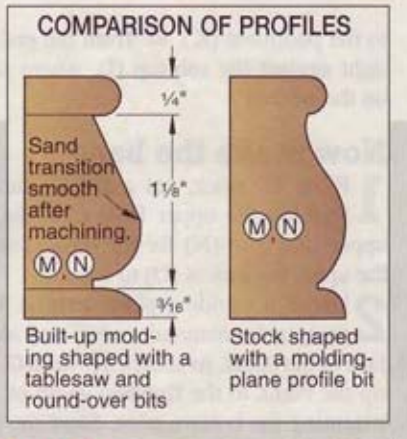
1 From ¾" stock, cut the sub-top (I) to size. Rout a ½" cove along the ends and then front edge of the piece on the *bottom* face, where shown on **Drawing 2**. Switch to a ⅛" round-over bit. Then rout along the ends and front edge on the *top* face. Now complete rounding of the coved lip, as shown in **Photo B**. Sand the sub-top smooth.

2 From ¾" stock planed to ⅜" thick, cut the top (J) to size. Then, from ¾" stock, cut the pediment (K) to size. Make two copies of the full-size pediment and onlay patterns from the *WOOD Patterns*® insert. Spray-adhere one copy to the pediment. Set aside the other copy for making the pediment onlays (L). Bandsaw and sand the angled top of the pediment to shape. Remove the pattern.

3 Glue and clamp the pediment (K) to the front edge of the top (J), keeping the ends and bottoms flush. Then glue and clamp the pediment/top assembly to the sub-top (I), centered side-to-side and flush at the back.

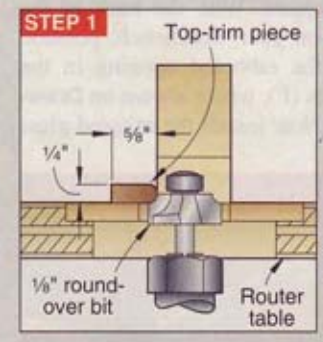
4 From ¾" stock, resaw and sand a ⅛×2⅜×8¾" piece for the pediment onlays (L). For a showy look, select stock with interesting figure, such as burl (our choice), and consider resawing two pieces to create eye-grabbing book-matched onlays. Spray-adhere the remaining pattern for the onlays to the piece. Using a #2 reverse-tooth blade in your scrollsaw, cut and sand the onlays to shape. Then glue and clamp them

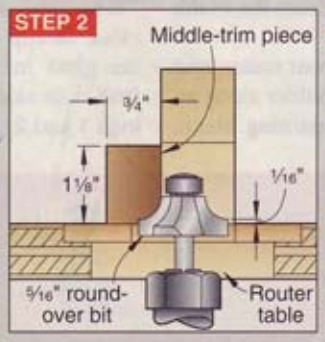
B Using a ⅛" round-over bit, rout along the ends and then front edge on the *bottom* of the sub-top (I) coved lip.

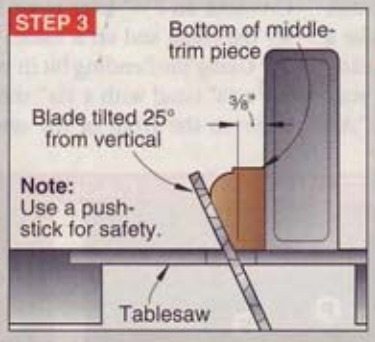


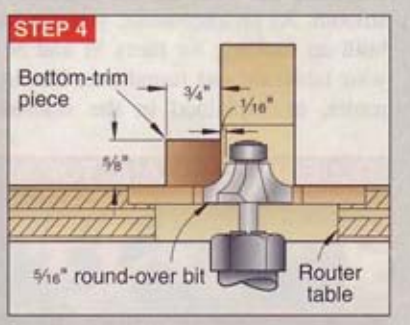
An optional way to form a molding-plane profile

Don't have a molding-plane profile bit for shaping the upper front and side trim (M, N) for the clock base? No problem. You easily can make a three-piece built-up molding with a nearly identical profile, as shown at *right*, using your tablesaw and router with ⅛" and 5/16" round-over bits. From a ¾×4×24" piece of stock, rip a ⅝"-wide strip for the bottom-trim piece and 1⅛"-wide piece for the middle-trim piece. Plane the remaining stock to ⅝" thick. Then rip a ¼"-wide strip for the top. Now machine and laminate the trim using this six-step process.









STEP 1 Using your table-mounted router, rout ⅛" round-overs along one edge of the top-trim piece.

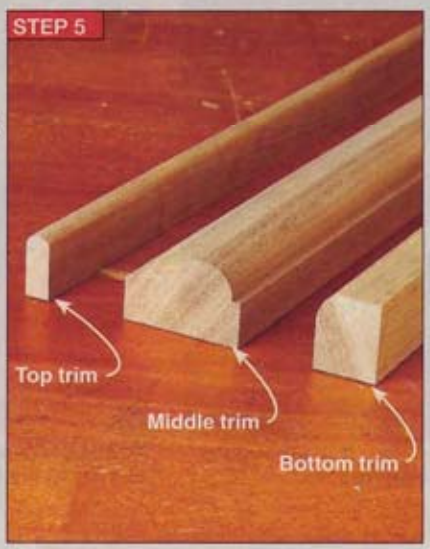
STEP 2 Switch to a 5/16" round-over bit. Rout a round-over with a 1/16" shoulder along an edge of the middle-trim piece.

STEP 3 With the middle-trim piece positioned on your tablesaw with the bottom edge up, bevel-rip the strip at 25°, where dimensioned.

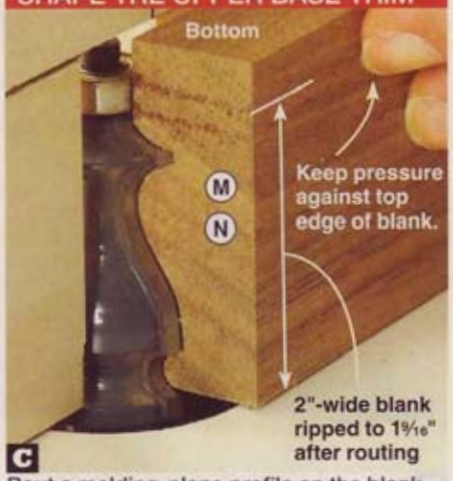
STEP 4 Using the 5/16" round-over bit in your router, rout a partial round-over along an edge of the bottom-trim piece.

STEP 5 With the trim pieces oriented as shown, glue and clamp them together, keeping the back faces and ends flush.

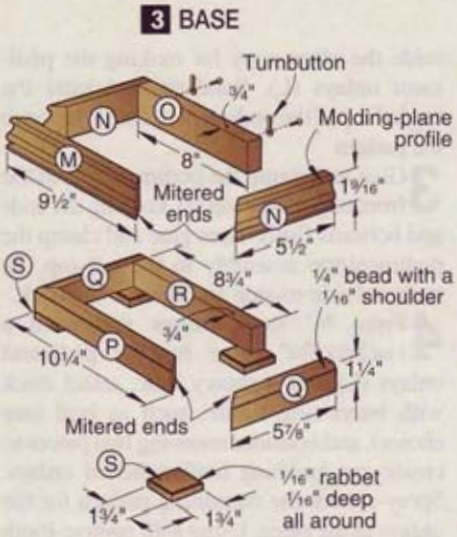
STEP 6 Rip the laminated trim to the finished width of 1 9/16", cutting the excess from the bottom. Sand the trim smooth.



SHAPE THE UPPER BASE TRIM



Rout a molding-plane profile on the blank for the upper base trim (M, N). Make three passes to ensure a smooth surface.



to the pediment (K), ¼" from the ends and tight against the sub-top (I), where shown on the pattern.

Now make the base

1 From ¾" stock, cut a 2×24" blank for forming the upper front trim (M) and upper side trim (N) for the base. Then cut the upper back cleat (O) to size.

2 Using a molding-plane profile bit in your table-mounted router, rout along a face of the blank, as shown in **Photo C**. Then rip the blank to the finished width of 1⁹⁄₁₆", trimming the bottom edge. Sand the blank smooth. As an alternative, you can make a built-up molding for parts M and N using your tablesaw and round-over bits in your router, as explained in the sidebar "An optional way to form a molding-plane profile," *page 75*.

3 Miter-cut the 9½"-long front trim (M) and two 5½"-long side trim pieces (N) from the blank, leaving the back ends of the side-trim pieces square. Then glue and clamp together the trim pieces and upper back cleat (O), where shown on **Drawing 3**, ensuring square and tight mitered corners. Sand the assembly.

4 From ¾" stock, cut a 1¼×34" blank for forming the lower front trim (P), lower side trim (Q), and lower back cleat (R). Crosscut an 8¾"-long piece from the blank for the cleat, and set it aside.

5 Using the beading bit in your router, rout a ¼" bead with a ⅛" shoulder along an edge on the front of the remaining blank, where shown on **Drawings 2** and **3**. As you did for the upper trim, miter-cut the lower front and side trim pieces (P, Q) to the lengths listed. Then glue and clamp the trim and back cleat (R) together. Sand smooth.

6 From ¾" stock planed to ⅜" thick, cut the feet (S) to size. Then, holding each foot with a handscrew for safety, rout a ⅛" rabbet ⅛" deep along the top edges of the foot, where shown. Sand smooth.

7 Glue and clamp the upper trim assembly (M/N/O) to the lower trim assembly (P/Q/R), centered side-to-side and flush at the back. Then glue and clamp the feet (S) to the bottom of the lower trim assembly at the corners, keeping the outer edges flush.

Time to finish up

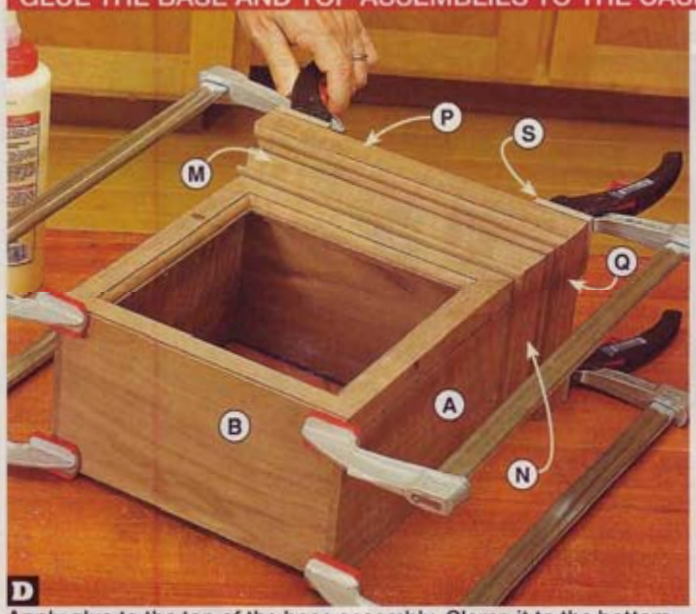
1 Glue the base assembly (M through S) to the case, as shown in **Photo D**. Then glue the top assembly (I through L) in place, as shown in **Photo E**.

2 Drill pilot holes and mount two turnbuttons each in the sub-top (I) and base upper back cleat (O) to retain the back (H), where shown on **Drawings 1**, **2**, and **3**, using the screws supplied with the hardware.

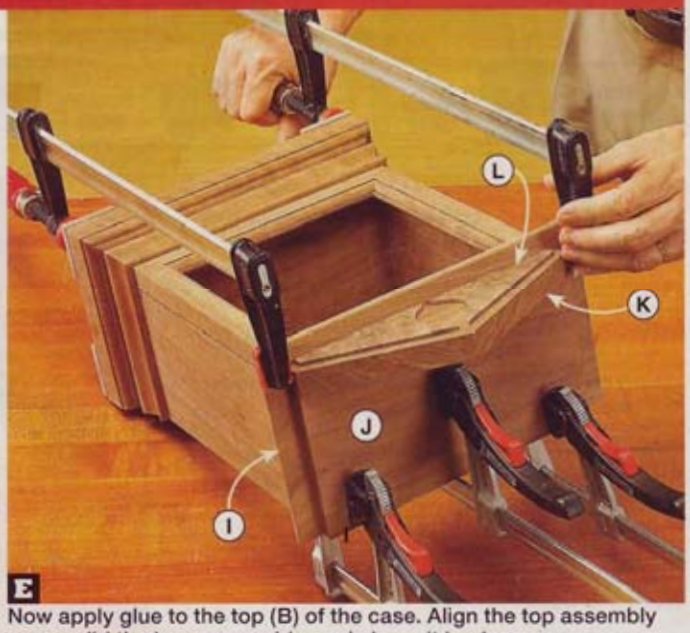
3 Finish-sand any areas of the clock that need it to 220 grit, and remove the dust. Apply a clear finish of your choice. (We applied three coats of aerosol satin lacquer, sanding to 320 grit between coats.)

4 Have a piece of single-strength glass cut to 7⅛" square. With the back of the clock faceup on your workbench, position the glass in the rabbeted opening in the faux-door sides (F), where shown on **Drawings 1** and **2**. Now install the mitered glass

GLUE THE BASE AND TOP ASSEMBLIES TO THE CASE

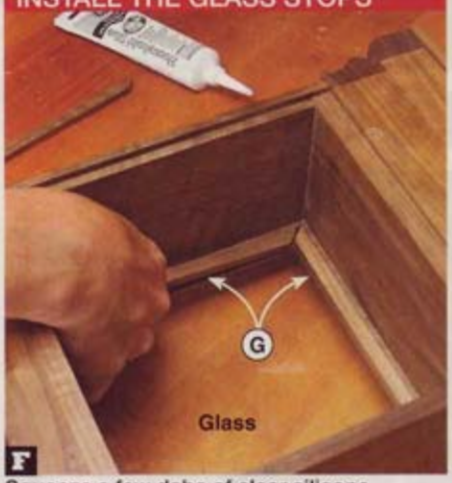


Apply glue to the top of the base assembly. Clamp it to the bottom of the case, flush at the back and centered side-to-side.



Now apply glue to the top (B) of the case. Align the top assembly as you did the base assembly, and clamp it in place.

INSTALL THE GLASS STOPS



Squeeze a few dabs of clear silicone household glue along the long edge of each glass stop (G). Install the stops in the door.

SLIDE IN THE CLOCK

With the clock face correctly oriented, slide the clock-face sides/backer assembly (C/D) into the case, tight against the stops (E).

stops (G) with clear silicone household glue (in place of fasteners), as shown in **Photo F**.

5 Apply a couple dabs of clear silicone household glue to the back of the clock-face stops (E). Install them in the case tight against the glass stops (G), case sides (A), and top and bottom (B), where shown on **Drawings 1** and **2**.

6 Adhere the clock face to the clock-face backer (D) using a few small pieces of double-faced tape. (This keeps the face from rotating when mounting the clock movement.) Mount the clock movement and hands to the backer using the rubber washer and brass washer and nut supplied with the movement, where shown on **Drawing 1**. Install a 1.5-volt AA-size battery in the clock movement, and set the time, as explained in the supplied instructions.

7 Finally, install the clock-face sides/backer assembly (C/D) into the case, where shown on **Drawing 4** and as shown in **Photo G**. Then install the back (H) in the rabbeted opening, and secure the back with the turnbuttons. Now place your masterpiece on a tabletop or shelf where you can admire it all the time.

Written by **Owen Duvall**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

Materials List

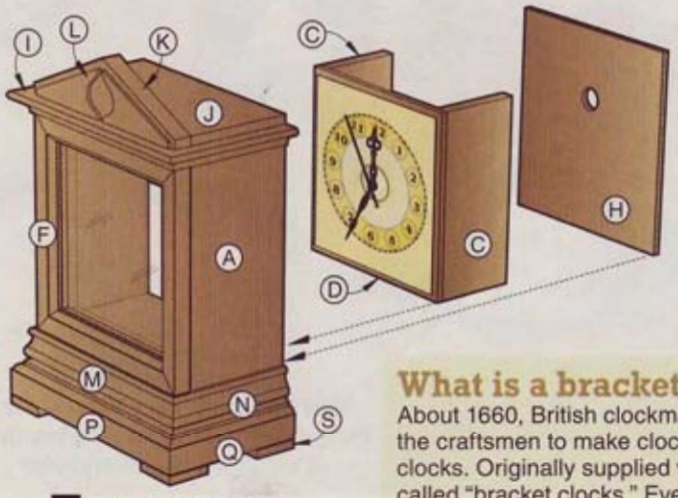
Case		FINISHED SIZE T	W	L	Matl.	Qty.
A	sides	½"	4⅜"	8¾"	W	2
B	top and bottom	½"	4⅛"	8¼"	W	2
C	clock-face sides	½"	3⅜"	7 1⁄16"	W	2
D	clock-face backer	¼"	7 1⁄16"	7 1⁄16"	WP	1
E*	clock-face stops	⅜"	½"	7¾"	W	4
F*	faux-door sides	¾"	1"	8¾"	W	4
G*	glass stops	¼"	⅜"	7½"	W	4
H	back	¼"	8¼"	8¾"	WP	1
Top						
I	sub-top	¾"	5⅞"	10¼"	W	1
J	top	⅜"	4⅜"	8¾"	W	1
K	pediment	¾"	2⅜"	8¾"	W	1
L*	pediment onlays	⅛"	2"	4"	W	2
Base						
M*	upper front trim	¾"	1 9⁄16"	9½"	W	1
N*	upper side trim	¾"	1 9⁄16"	5½"	W	2
O	upper back cleat	¾"	1 9⁄16"	8"	W	1
P*	lower front trim	¾"	1¼"	10¼"	W	1
Q*	lower side trim	¾"	1¼"	5⅞"	W	2
R*	lower back cleat	¾"	1¼"	8¾"	W	1
S	feet	⅜"	1¾"	1¾"	W	4

*Parts initially cut oversize. See the instructions.

Materials key: W–walnut, WP–walnut plywood.
Supplies: Spray adhesive; single-strength glass, 7 1⁄16" square; clear silicone household glue; double-faced tape; turnbuttons (4); 1.5-volt AA-size battery.
Blades and bits: Dado-blade set; #2 reverse-tooth scrollsaw blade; ¼" beading, rabbeting, ½" cove, ⅛" round-over, and molding-plane profile router bits; 1" Forstner bit. If making built-up molding for the base upper trim (M, N), use ⅛" and 5⁄16" round-over bits in place of a molding-plane profile router bit.

Sources

Clock kit: Contains a clock movement; hands (3); clock face; single-strength glass, 7 1⁄16" square, for the faux door; and turnbuttons (4) with screws. Order kit no. 35327, $17.34 ppd. Call or click Klockit; 800/556-2548, klockit.com.
Lumber kit: Enough walnut, including walnut burl for the pediment onlays, for one clock. Order kit no. W174, $64.95 ppd. Call or click Heritage Building Specialties; 800/524-4184, heritagewood.com.
Molding-plane bit: Molding-plane profile router bit no. 7965 with ½" shank, $31.95. Call or click MLCS; 800/533-9298, mlcswoodworking.com.

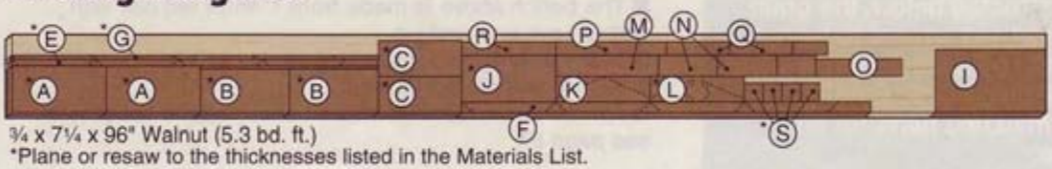


4 FINAL ASSEMBLY

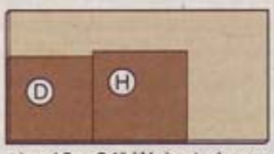
What is a bracket clock?

About 1660, British clockmakers began using springs to drive pendulum clocks. This allowed the craftsmen to make clocks smaller than the longer-pendulum, weight-driven tallcase clocks. Originally supplied with a bracket for wall mounting, the smaller timepieces were called "bracket clocks." Eventually, the term applied to any small clock that stood on a shelf or piece of furniture. Not restricted to wall mounting, bracket clocks were moved from room to room, as needed. Common characteristics of these clocks include ornate dials, metal inlays, wood or tortoise-shell veneer onlays, a pediment, and a decorative base. Some clocks also have a handle.

Cutting Diagram



¾ x 7¼ x 96" Walnut (5.3 bd. ft.)
*Plane or resaw to the thicknesses listed in the Materials List.



¼ x 12 x 24" Walnut plywood

sturdy and stylish

wedged-tenon bench

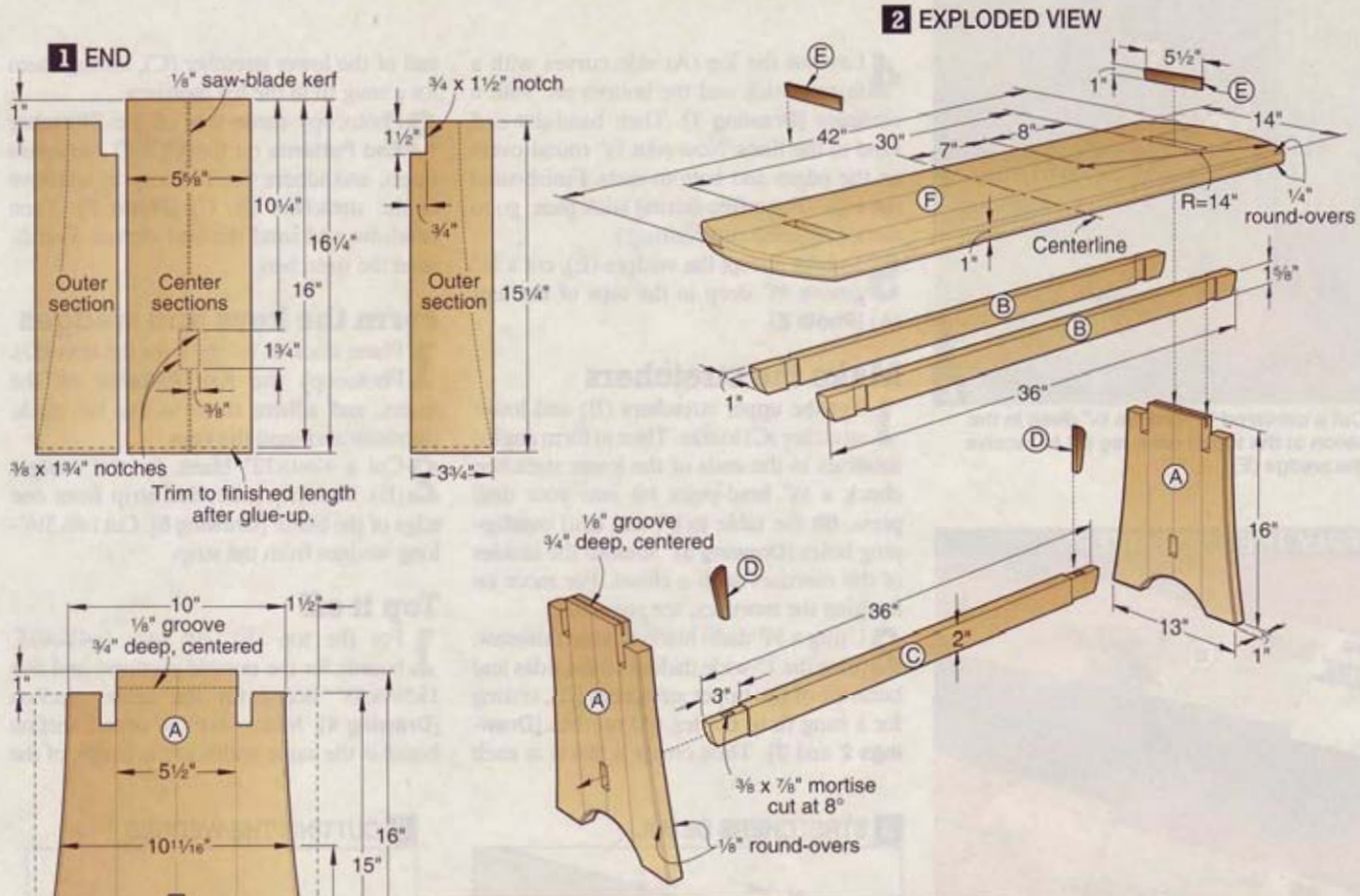
Make through-mortises the simple way—by using a tablesaw coupled with edge-glued parts. Later, you'll assemble the bench using eye-catching joints that feature keys and wedges in contrasting wood.

View a 12-Photo Slide Show of the Wedged-Tenon Bench coming together at woodmagazine.com/slides.

Note: We were lucky to find a 16"-wide oak plank for the legs (A) and top (F) from which to cut the four parts for each leg and the three parts for the top. When edge-joined after machining, as instructed below, the grain matches perfectly, and the mortises appear to be cut into the part rather than formed by mating notches. But don't worry if you can't find a wide plank. Careful board selection will give you grain-matched parts for an equally attractive appearance.

AT A GLANCE

- Overall dimensions are 14" wide × 42" long × 16" high.
- The bench *above* is made from 1"-thick red oak with walnut keys and wedges.
- Learn techniques for securing tenons with keys and wedges.
- No hardware is necessary.
- For the board feet of lumber needed to build this project, see *page 81*.



Begin with the ends

1 For the center sections of the legs (A), cut two 5⅝×16¼" boards from 1" stock. Then for the outer sections of the legs, cut four 3¾×15¼" boards from the same stock [**Drawing 1**].

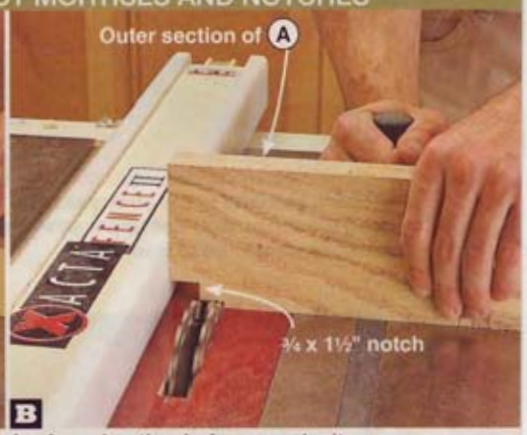
2 Rip the 5⅝"-wide leg (A) center sections in half, using a ⅛"-kerf saw blade in your tablesaw. Then switch to a ¾" dado blade and cut a mating notch in each half [**Drawing 1** and **Photo A**]. Now form a notch in each leg outer section [**Photo B**].

3 Glue and clamp the leg (A) center sections together [**Photo C**]. Then with the glue dry, glue and clamp the outer sections to the center sections [**Photo D**]. The protruding portions of the center sections form tenons to fit into the bench top (F) mortises [**Drawing 2**]. Trim the ends to the final length of 16", removing material only from the bottom edges.

EDGE-JOIN THE ENDS TO FORM PERFECT MORTISES AND NOTCHES

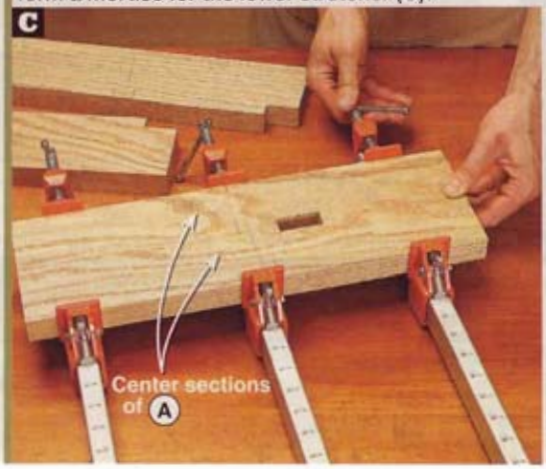
Using the rip fence as a stop, and backing the cuts with a miter gauge extension, form notches in the leg (A) center sections.

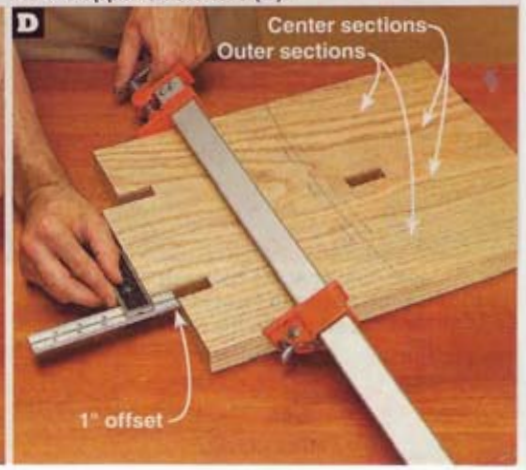
Edge-join the leg (A) center section halves, keeping the ends flush to align the notches, to form a mortise for the lower stretcher (C).



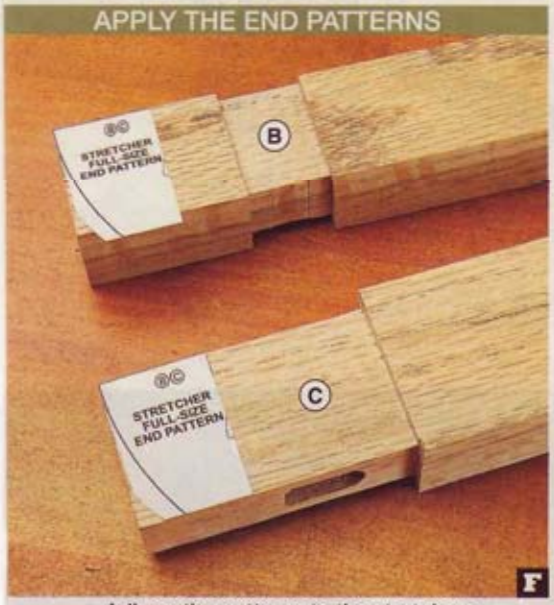
Again, using the rip fence and miter gauge extension, cut notches in the top inside edges of the leg (A) outer sections.

Add the leg (A) outer sections to the center section, offsetting the tops, to form notches for the upper stretchers (B).

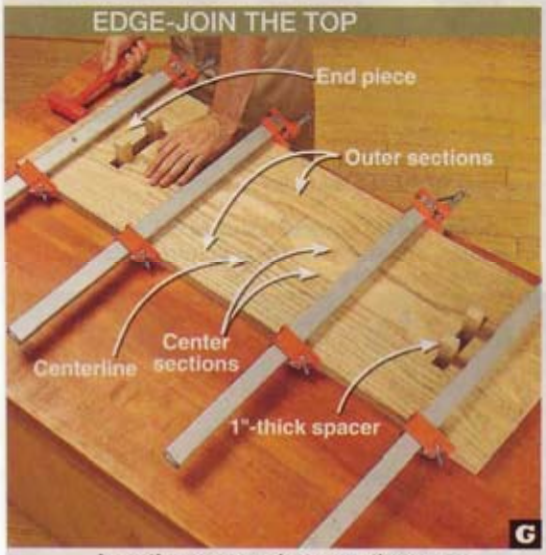




Cut a centered ⅛" groove ¾" deep in the tenon at the top of each leg (A) to receive the wedge (E).



Adhere the patterns to the stretchers, aligning the top edges. The upper stretcher pattern overhangs the bottom edge.



Inserting spacers between the center section parts to form mortises for the leg tenons, edge-join the outside sections.

4 Lay out the leg (A) side curves with a fairing stick and the bottom arc with a compass [**Drawing 1**]. Then bandsaw and sand to the lines. Now rout ⅛" round-overs on the edges and bottom ends. Finish-sand the legs. (For a free fairing stick plan, go to woodmagazine.com/fairing.)

5 To later accept the wedges (E), cut a ⅛" groove ¾" deep in the tops of the legs (A) [**Photo E**].

Make the stretchers

1 Cut the upper stretchers (B) and lower stretcher (C) to size. Then to form angled mortises in the ends of the lower stretcher, chuck a ⅜" brad-point bit into your drill press, tilt the table to 8°, and drill overlapping holes [**Drawing 3**]. Smooth the insides of the mortises with a chisel. For more on forming the mortises, see *page 104*.

2 Using a ¾" dado blade in your tablesaw, form the 1"-wide dadoes in the sides and bottoms of the upper stretchers (B), testing for a snug fit in the leg (A) notches [**Drawings 2** and **3**]. Then create a tenon at each end of the lower stretcher (C), testing them for a snug fit in the leg mortises.

3 Photocopy three sets of the **Stretcher End Patterns** on the *WOOD Patterns®* insert, and adhere them with spray adhesive to the stretchers (B, C) [**Photo F**]. Then bandsaw and sand the end curves. Finish-sand the stretchers.

Form the keys and wedges

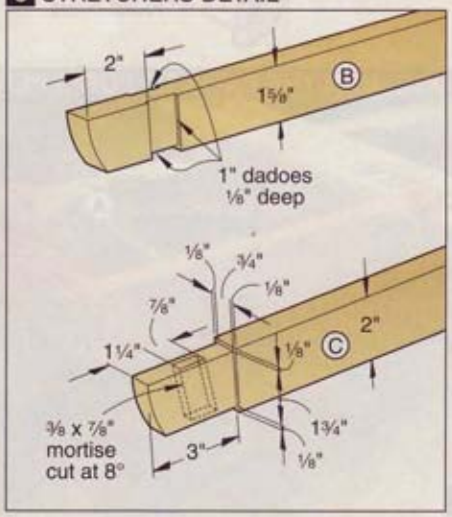
1 Plane stock to ⅜" thick for the keys (D). Photocopy the **Key Patterns** on the insert, and adhere them to the ⅜" stock. Bandsaw and sand the keys.

2 Cut a ¾×1×12" blank for the wedges (E). Then rip a beveled strip from one edge of the blank [**Drawing 5**]. Cut two 5½"-long wedges from the strip.

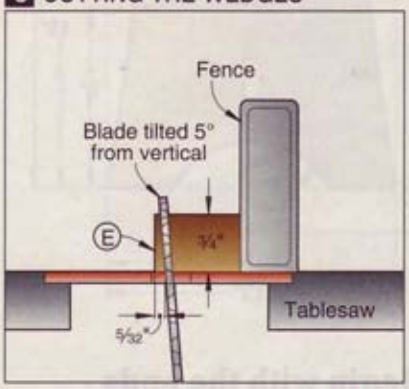
Top it off

1 For the top (F), cut two 1×4¼×43" boards for the outside sections, and one 1×5½×43" board for the center section [**Drawing 4**]. Make sure the center section board is the same width as the length of the

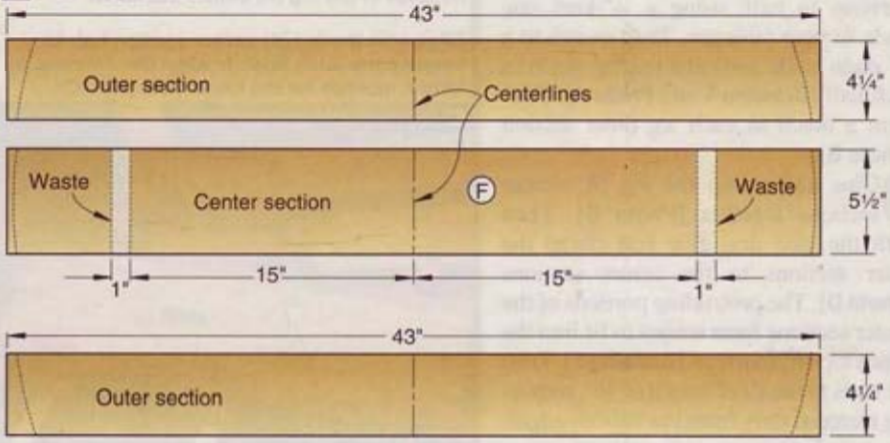
3 STRETCHERS DETAIL



5 CUTTING THE WEDGES



4 TOP ASSEMBLY



tenons at the tops of the legs (A). Then draw centerlines across the widths of the boards. Now to form the top mortises, cut away the 1"-long waste portions, where shown. Mark the orientation of the two short end pieces of the center section for reassembly.

2 Before gluing up the top (F), cut four 1"-thick spacers from scrap. Make certain they are the same thickness as the tenons on the ends (A). Then glue and clamp the top (F) [**Photo G**]. Remove the spacers and let the glue dry.

3 Lay out the top (F) end arcs with a beam compass [**Drawing 2**], and bandsaw or jigsaw and sand to the lines. Then rout ¼" round-overs on all ends and edges of the top. To make it easy to insert the snug-fitting leg (A) tenons into the top mortises, see the **Shop Tip** *below*. Finish-sand the top.

Now put it together

1 Dry-fit the legs (A), stretchers (B, C), and top (F) without keys (D) or wedges (E), and make any necessary adjustments. When satisfied with the fit, insert the lower stretcher (C) into the legs and tap the keys securely in place [**Photo H**]. (Glue isn't necessary with this strong mechanical joint.)

2 Apply glue to the dadoes in the upper stretchers (B), and slide them into the notches in the ends (A) [**Photo I**].

3 Apply glue to the top edges of the upper stretchers (B). Then, capturing the leg (A) tenons in the top (F) mortises, tap the top into place with a mallet. Apply glue to the wedges (E), and tap them into the tenon grooves [**Photo J**].

4 With the glue dry, sand the wedges flush with the top (F). Inspect all the parts and finish-sand, where needed.

5 Apply the finish. (We used Varathane Premium Wood Stain no. 206 Summer Oak, topped with three coats of Aqua Zar water-based satin polyurethane, sanding with 220-grit sandpaper between coats.)

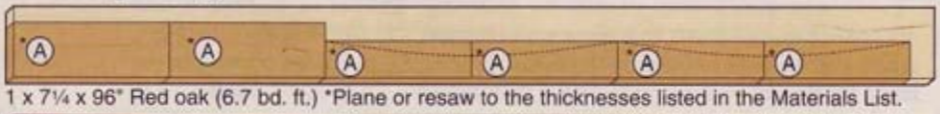
Written by **Mark Lane** and **Jan Svec**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

SHOP TIP

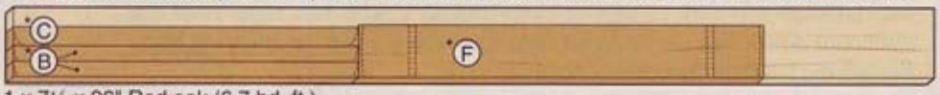
Easing mortise edges eases assembly

Dry-fitting and final assembly go faster when mortises and tenons come together without a fight. Easing the edges of a mortise guides the tenon into place. To do this when fitting the bench leg (A) tenons into the top (F) mortises, chuck a 45° chamfer bit into your handheld router and adjust it to cut ⅛" deep. Make a pass around the mortises on the underside of the top (F), and clean up the corners with a chisel.

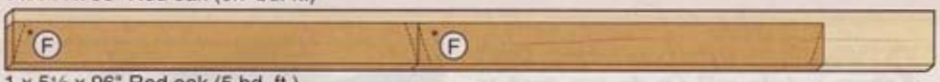
Cutting Diagram



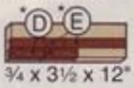
1 x 7¼ x 96" Red oak (6.7 bd. ft.) *Plane or resaw to the thicknesses listed in the Materials List.



1 x 7¼ x 96" Red oak (6.7 bd. ft.)



1 x 5½ x 96" Red oak (5 bd. ft.)



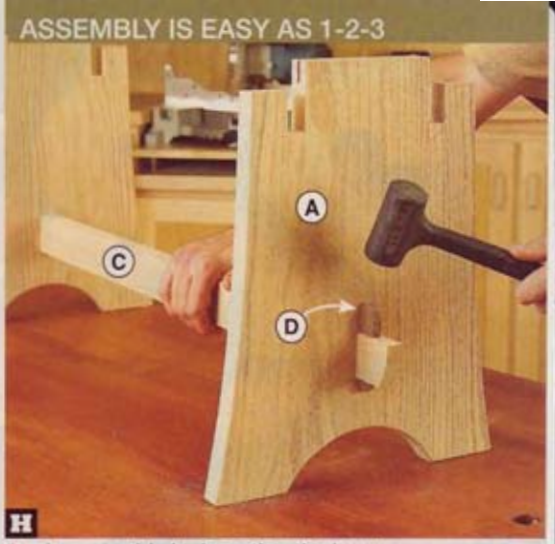
¾ x 3½ x 12" Walnut (.3 bd. ft.)

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	legs	1"	13"	16"	EO	2
B	upper stretchers	1"	1⅝"	36"	O	2
C	lower stretcher	1"	2"	36"	O	1
D*	keys	⅜"	11/16"	3½"	W	2
E*	wedges	¾"	5/32"	5½"	W	2
F*	top	1"	14"	42"	EO	1

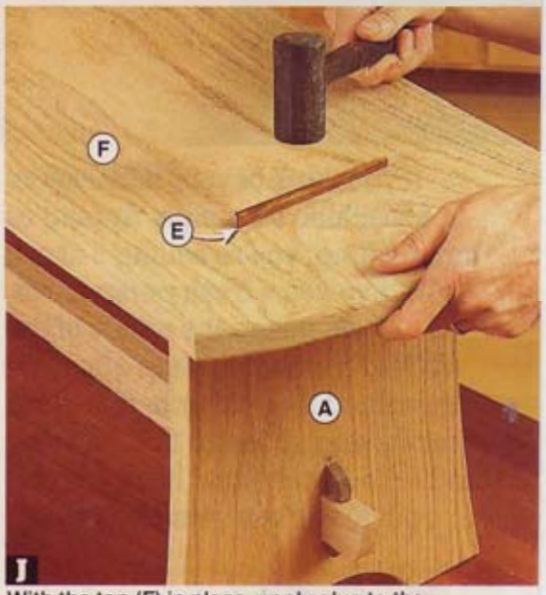
*Parts initially cut oversize. See the instructions.
Materials key: EO–edge-joined oak, O–oak, W–walnut.
Supply: Spray adhesive.
Blade and bits: Stack dado set, ⅛" and ¼" round-over router bits, ⅜" brad-point bit.

ASSEMBLY IS EASY AS 1-2-3



Begin assembly by inserting the lower stretcher (C) tenons into the leg (A) mortises, and tapping the keys (D) firmly into place.

Spread glue in the upper stretcher (B) dadoes, and tap the stretchers into the notches in the legs (A).



With the top (F) in place, apply glue to the wedges (E) and tap them into the grooved tenons of the legs (A).

23 tablesaw tips, tricks, and techniques

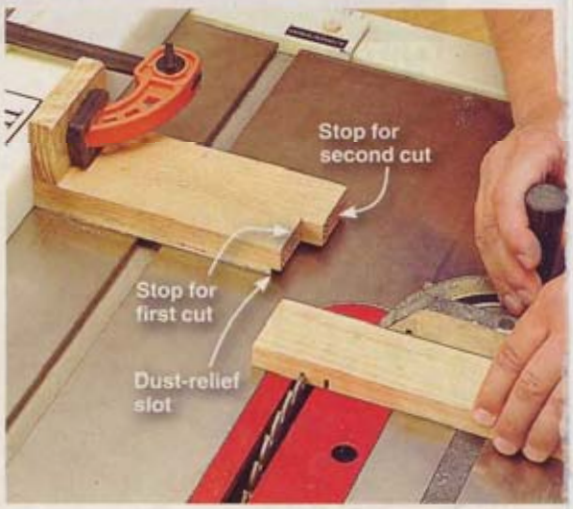
Save time and money by making your saw work smarter

1 ***Make a quick zero-clearance tabletop.*** Instead of crafting a new zero-clearance insert to replace your tablesaw's factory throat-plate insert, create a temporary tabletop for your saw in seconds, as shown *above*. Set the fence for the cut you intend to make; then mount a piece of ¼" hardboard to your tablesaw top with clamps or cloth-backed, double-face tape. Hold the hardboard down with another scrap and then slowly raise the spinning blade through the hardboard to cutting height.

If you think of your tablesaw as a machine for simply ripping or crosscutting, you're selling it short. To give you a fresh perspective, we mined the minds of the *WOOD*® magazine shop guys and unearthed their favorite time- and work-saving tablesaw tips. Here's a mother lode of helpful hints you can put to work in your shop today.

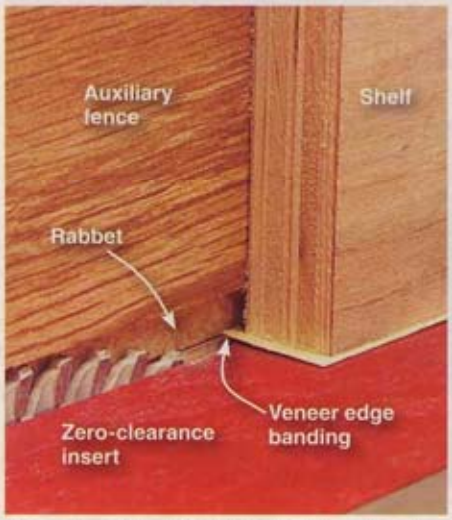
Note: Blade guards have been removed in these photos for clarity. Always use the appropriate safety guards with your tools.

2 ***Two-step stop defines a dado.*** Don't have a dado set? Or do you need to machine a dado wider than your stacked set can handle? You can cut consistently wide slots using this double stop. The key dimension is the distance between the ends of the stops: Subtract the width of the desired dado from the width of the saw blade or dado set, and then offset the stop ends by that amount. Position the stock against one stop, make the first cut, and then reposition it against the other stop and make the second cut. (If you're using a single saw blade, "nibble" away the waste between the kerfs.) To keep the jig accurate, we created dust relief by adding a ¼" plywood spacer, slightly offset, to the bottom of the fixture.

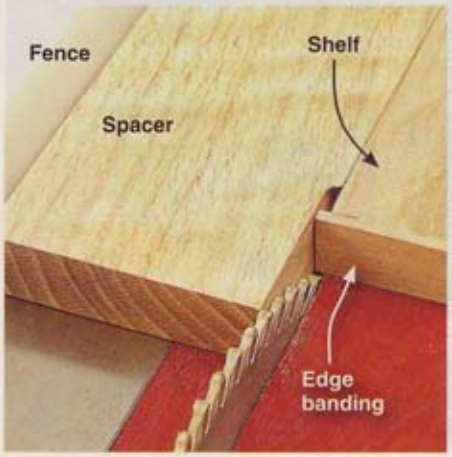


Set up your tablesaw for success

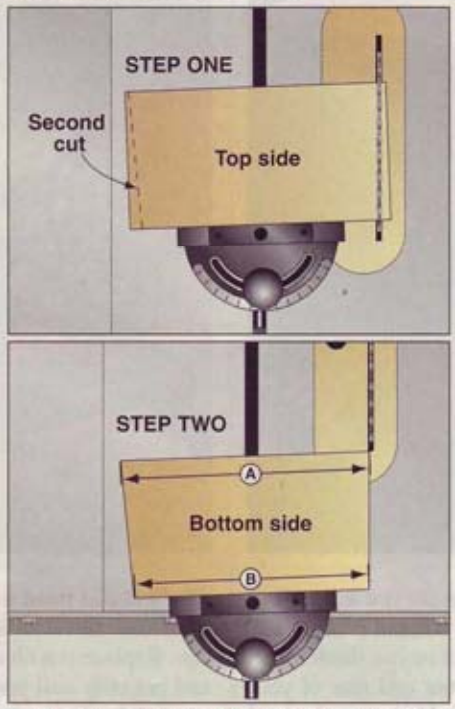
3 *Tablesaw-trim edge banding.* Don't precariously perch a router on the edge of a plywood shelf to clean up overhanging edges on solid-wood or veneer banding. Instead, make an auxiliary fence 4–6" tall and cut a rabbet into its face at least as wide as the blade's kerf. Mount the auxiliary fence to your rip fence and position it so that its face is flush with the outside edge of the blade. (Test the setup by running scrapwood against the fence: If the blade contacts the scrap, nudge the fence closer to the blade and test it again.) Hold the shelf to be trimmed—banding down, with the excess edging in the rabbet, as shown *below*—and trim it flush. For best results, use an 80-tooth carbide blade and zero-clearance insert.



4 *Trim edge banding, the sequel.* Use a similar technique to flush-trim the excess length from solid-wood edge banding. This time, though, cut a notch just a whisker wider than your saw blade in a piece of scrapwood spacer, as shown in the photo *below*. Again, position your fence so that the outside edge of the spacer is flush with the outside of the blade, and make a test cut. Finally, trim off the end of the banding as shown.



5 *Calibrate your miter gauge, part I.* To ensure that your miter gauge squares with the blade, try this trick: Set it for a 90° cut and then crosscut one end of a 6" (or wider) scrap. Flip the scrap top-for-bottom, keeping the same edge against the miter gauge, as shown *below*, and repeat the cut at the other end of the scrap. Now, compare the lengths of the two edges of the scrap using a precision steel rule. If A and B match exactly, the miter gauge is square. If not, adjust the gauge and repeat the test cuts until they are, and reset the cursor.



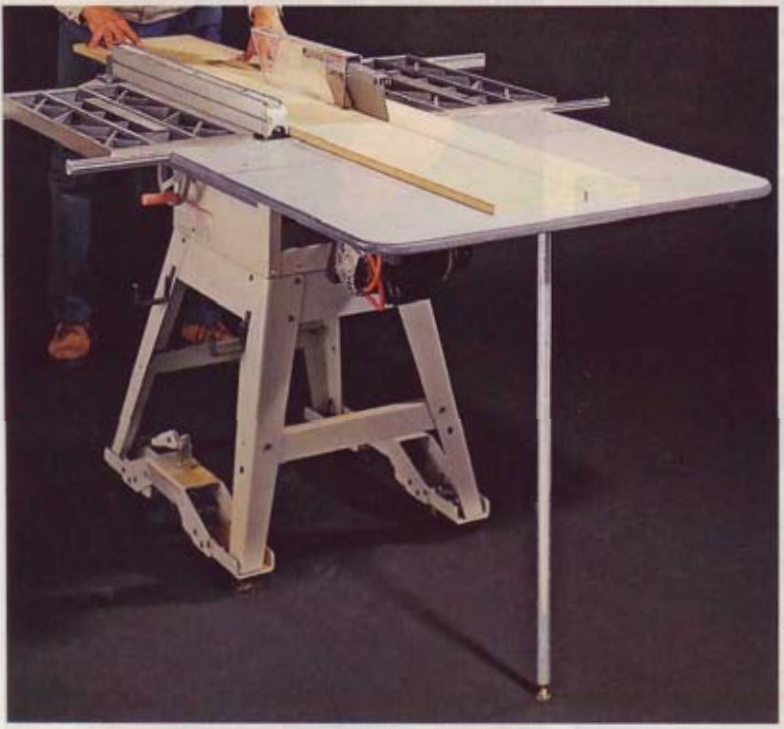
6 *Locate the "wide" teeth fast.* With an adjustable dado blade (sometimes called a "wobbler"), it's hard to tell which tooth cuts farthest to the left and which cuts farthest to the right. Find the widest-cutting tooth—or teeth, in the case of the dual-blade adjustable dado, shown *below*—using a square. Then label that tooth's post with a permanent marker. Now you can measure from that tooth when setting up your cut.

7 *Calibrate your miter gauge, part II.* Tip #5 doesn't work to check the 45° stop, so do this instead. Lay a reliable framing square on the tabletop, as shown *below*, so that the edge of the miter slot aligns with the same dimension marking on both legs of the square. (In the photo, we used the 6" markings inside the square.) Now, loosen the miter gauge, slide it flat up against one leg of the square, and retighten it. Reset the 45° stop, if your miter gauge has one.

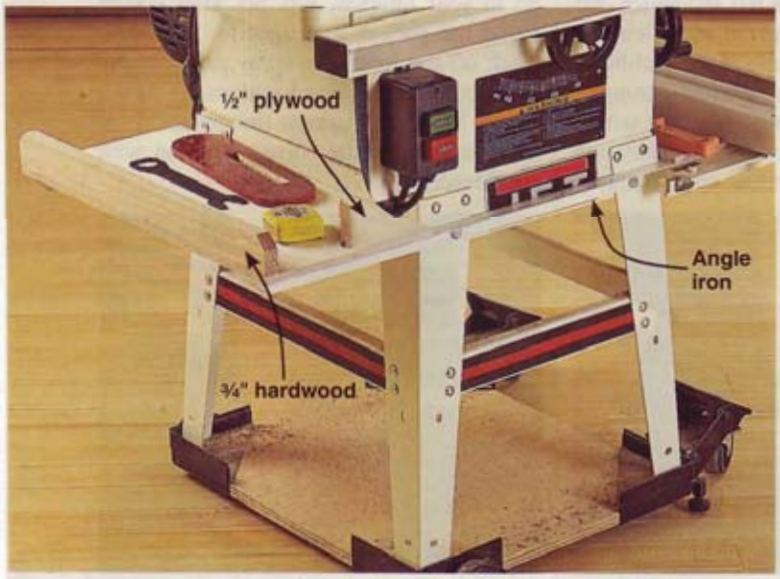
8 *Leave a perfect footprint.* Cast iron is softer than you might think, and an uneven floor can actually transfer its warp up to your tablesaw top. So, after you've found the perfect level spot for your saw, mask off the legs, then spray paint around each foot to mark their locations, as shown *below*. Now you can stow the saw and later move it back to the correct location with confidence.

Add more support and storage to your saw

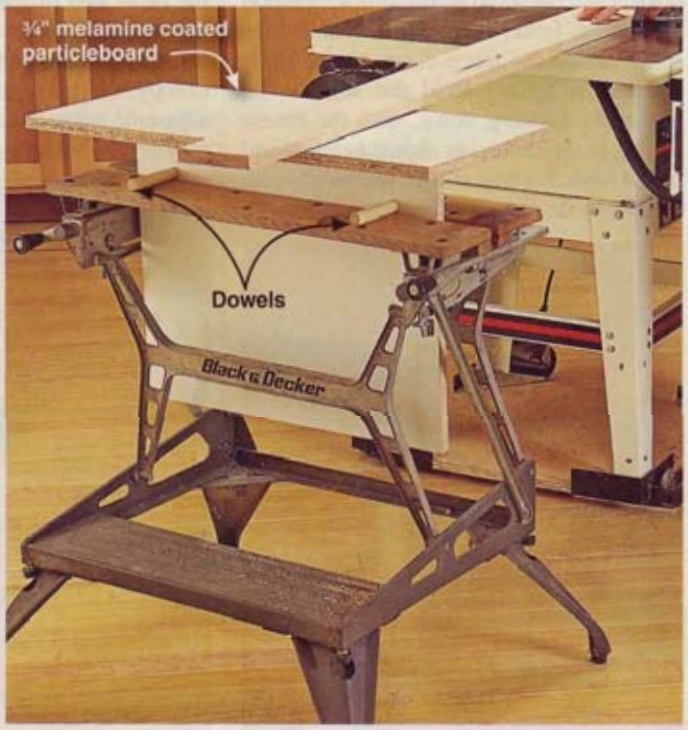
9 ***Take your outfeed table on the road.*** A permanent outfeed table isn't practical in a small shop: You just can't dedicate that much real estate to it. The fold-down outfeed table, shown *below*, extends 3' of support beyond the blade, yet adds only a few inches of depth to the back of the saw when stowed. And it's always ready, even on a mobile-base-equipped saw. (You'll find plans for this outfeed table at woodmagazine.com/outfeed.)



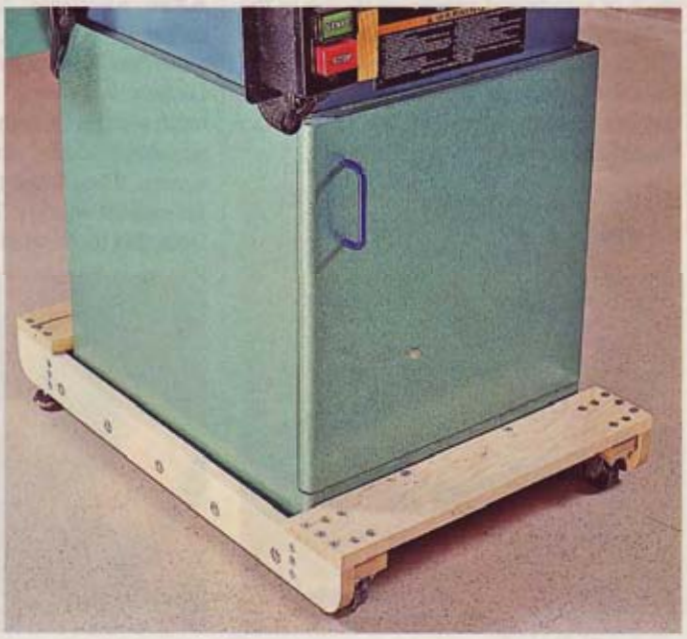
10 ***Put wings beneath your wings.*** How do you keep all of those tablesaw accessories close at hand without being under foot? Take two pieces of 1" angle iron a couple of inches shorter than the width of your saw and bolt them to the front and rear of your contractor-style saw's stand, as shown *below*. Now cut plywood shelves to fit between the stand and the ends of the angle iron, and bolt them on top of it. Add a strip of hardwood at the end of each shelf to keep things from falling off, and you gain valuable storage space.



11 ***Make an instant extension table.*** A simple T-shape support, made from scrap plywood or MDF, mounts in your portable clamping workstation, as shown *below*. Once you've matched the support to your table height, drill the base of the support and insert dowels to instantly set the height each time. To make this table even more versatile, use it with your bandsaw and miter-saw, drilling separate dowel holes for each height.

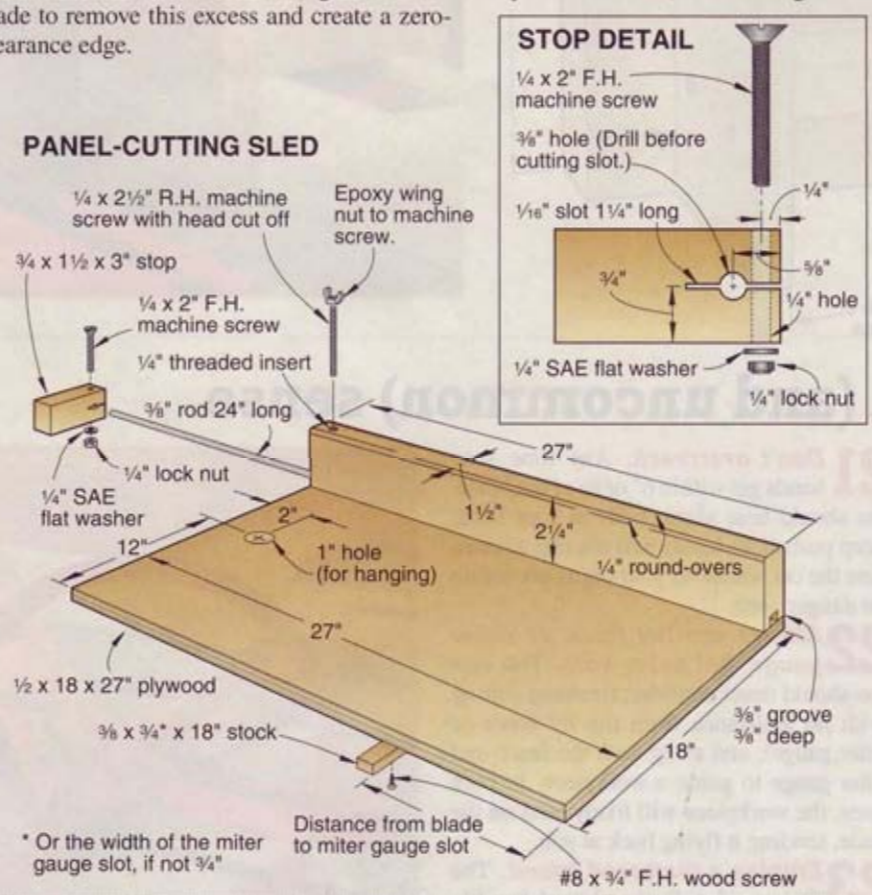


12 ***Build your own base.*** There's no law that says you have to use the steel leg stand that came with your contractor-style saw. Replace it with a simple cabinet, such as the one shown *below*, and not only will you add enclosed storage; but your saw also will run quieter. For a more elaborate and versatile take on this concept, visit woodmagazine.com/tsbase.

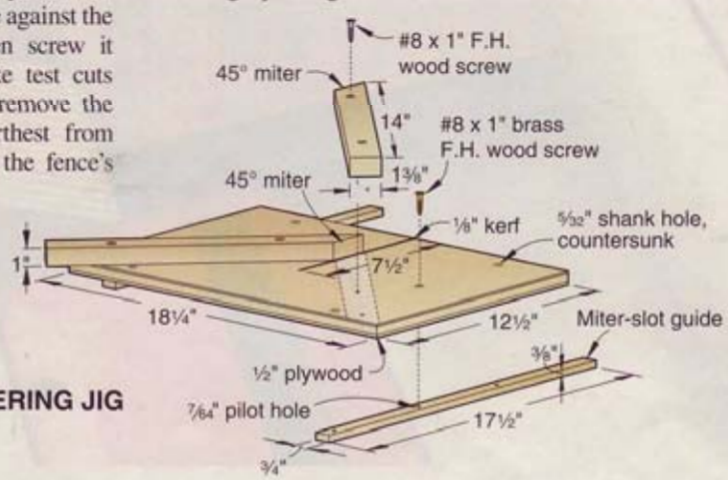


Four simple jigs increase speed and accuracy

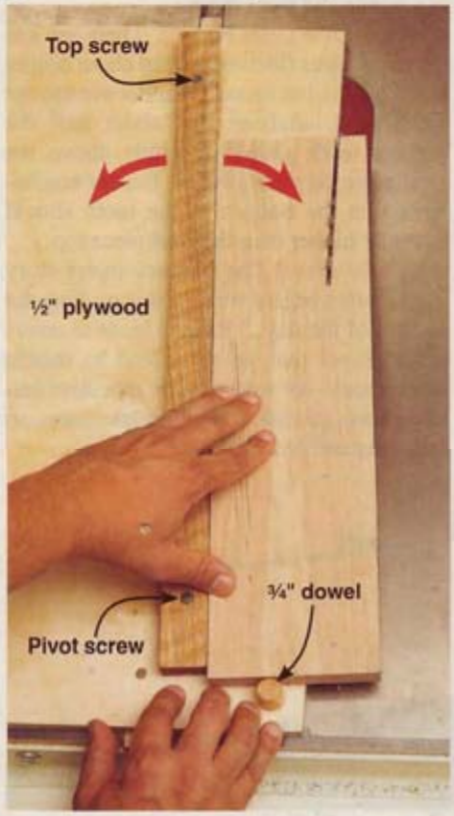
13 ***Make cleaner crosscuts.*** A zero-clearance crosscut sled virtually eliminates tear-out in veneered plywood, guarantees a square cut, and costs just pennies to make. We spiffed up the sled shown *below* with an adjustable stop, but that's just the icing on the cake. This fence-forward design allows you to cut wider workpieces than one with the fence closer to the operator. During assembly, locate the miter bar so that about ¼" of the fence will overhang the blade. Before you use the sled, run it through the blade to remove this excess and create a zero-clearance edge.



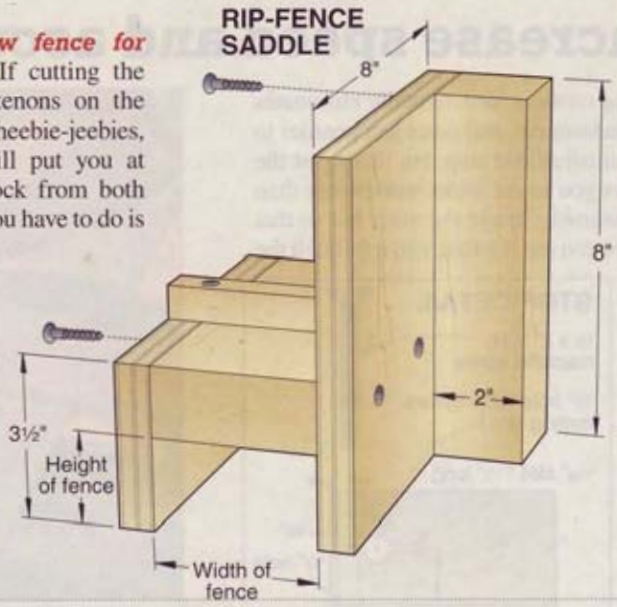
14 ***Miter better with a dedicated sled.*** For perfect miter joints, it's more important that both miter cuts add up to precisely 90° than each miter is exactly 45°. This blade-straddling miter-cutting sled ensures that those complementary cuts always equal a right angle. To install the miter-slot guides on the bottom of the sled, place the guides in your saw's slots, set the sled on top of them, and then drive screws into the guides through the top of the sled. Now cut a blade kerf about halfway across the sled. Using a combination square, mark the location of the right-hand fence 45° to that kerf, and install the fence on that line. Now place a reliable framing square against that fence to locate the left fence, rest the left fence against the square, and then screw it into place. Make test cuts and if needed, remove the fence screw farthest from the kerf, adjust the fence's angle, and drive a new screw to secure it.



15 ***Taper with confidence.*** You can buy or build more elaborate tapering jigs, but this simple helper will handle most of your tapering chores. It runs against your saw's rip fence, so you needn't mount miter-slot guides on it. To use the jig, measure the width of the sled and set your fence that distance from the blade. Remove the top screw, loosen the pivot screw, rotate the fence to match your desired taper, and then tighten both screws. Butt your workpiece against the dowel with one edge against the jig's fence, and then cut your taper.



16 ***Saddle your saw fence for cutting tenons.*** If cutting the ends of parts such as tenons on the tablesaw gives you the heebie-jeebies, this rip-fence saddle will put you at ease. Supporting tall stock from both the side and behind, all you have to do is clamp the workpiece to the saddle and guide it through the cut. A coat of paste wax on the inside of the saddle where it contacts the fence makes it glide smoothly.



Practice common (and uncommon) sense

17 ***Keep it clean.*** Before making any cut, clear the tabletop of all scrap wood, tools, fasteners, and other debris. (That includes not using the top of your fence as a tool tray.) These objects not only distract but they also can become missiles.

18 ***Protect your eyes.*** Without face-hugging safety glasses, airborne dust and chips can blur your vision (not good in the middle of a cut), or worse, injure your eyes permanently. A decent pair of safety glasses costs less than a visit to the ER, so buy a pair and wear them.

19 ***Set the right height.*** There are lots of ideas floating around about proper blade height, but Freud's Jim Brewer has the final word, advising that about half the highest tooth should protrude above the workpiece, as shown *below*. Brewer emphasizes that the bottom of the tooth should never be higher than the workpiece top.

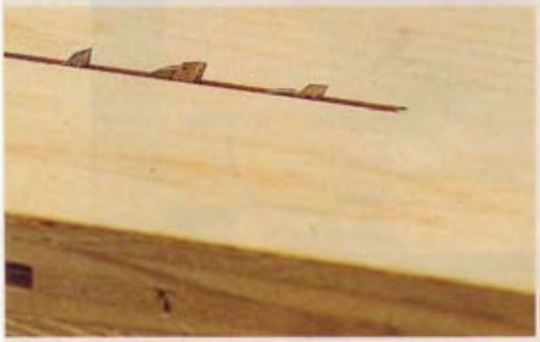
20 ***Be alert!*** The tablesaw-injury story often begins with, "I was making the last cut of the day..." Fatigue leads to errors in judgment that, in turn, lead to miscut workpieces—or worse. Also, repetitive cutting chores can lull you into carelessness, so take frequent breaks.

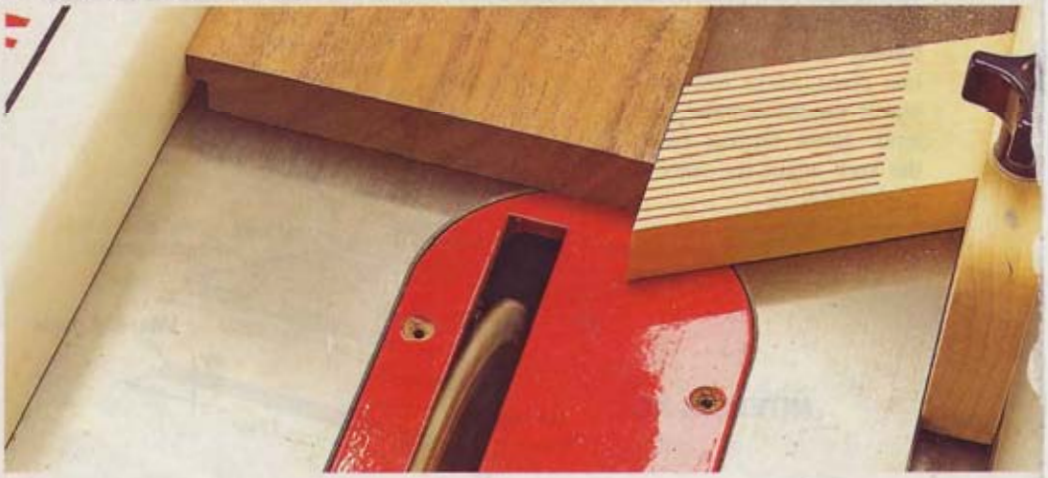
21 ***Don't overreach.*** Any time your hands get within 6" or so of the blade, you should hear alarm bells in your head. Keep pushsticks handy and use one to complete the cut whenever your digits get within the danger zone.

22 ***Always use the fence or miter gauge, but never both.*** Two cuts you should never consider: freehand cutting (with no assistance from the rip fence or miter gauge); and using *both* the fence and miter gauge to guide a workpiece. In both cases, the workpiece will likely bind on the blade, sending it flying back at you.

23 ***Employ a feathered friend.*** The fingers of a feather board handily hold a workpiece snug against the fence so you can concentrate on feeding it at a steady pace. Mount the feather board so that the fingers end before the cutting starts, as shown *below*, to prevent trapping the offcut and launching it across the shop.

Written by **Dave Campbell** with **Kevin Boyle**, **Chuck Hedlund**, and **Jeff Mertz**





Better Homes and Gardens®

WOOD® PATTERNS®

December/January 2006/2007 *Issue 174*

Dear Reader: As a service to you, we've included full-size patterns on this insert for irregular-shaped and intricate project parts. You can machine all other project parts using the Materials List and the drawings accompanying the project you're building.

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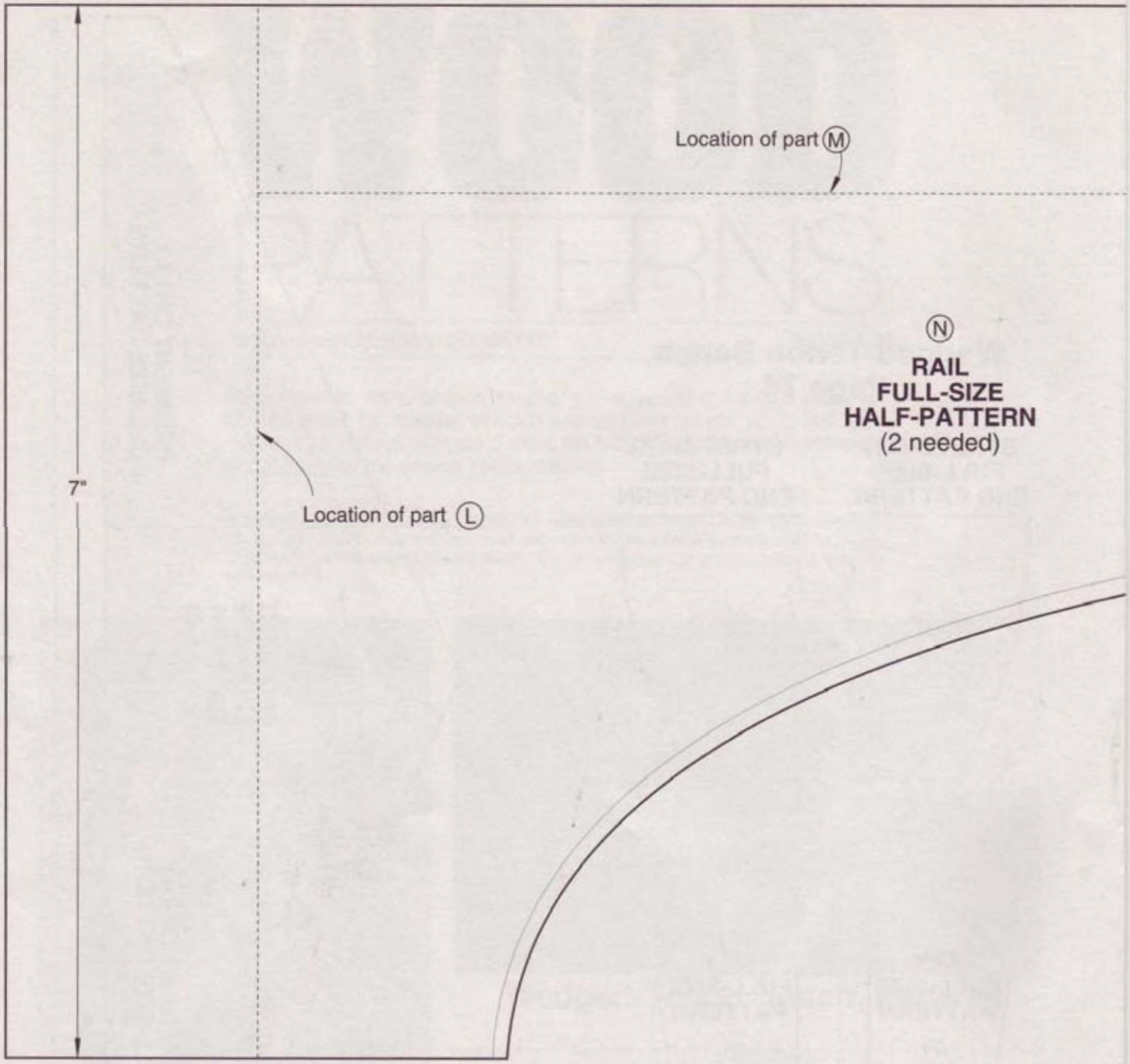
Corner Cabinet, Page 38

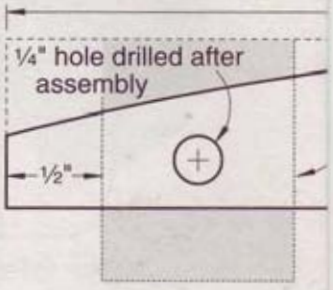
Wedged-Tenon Bench, Page 78

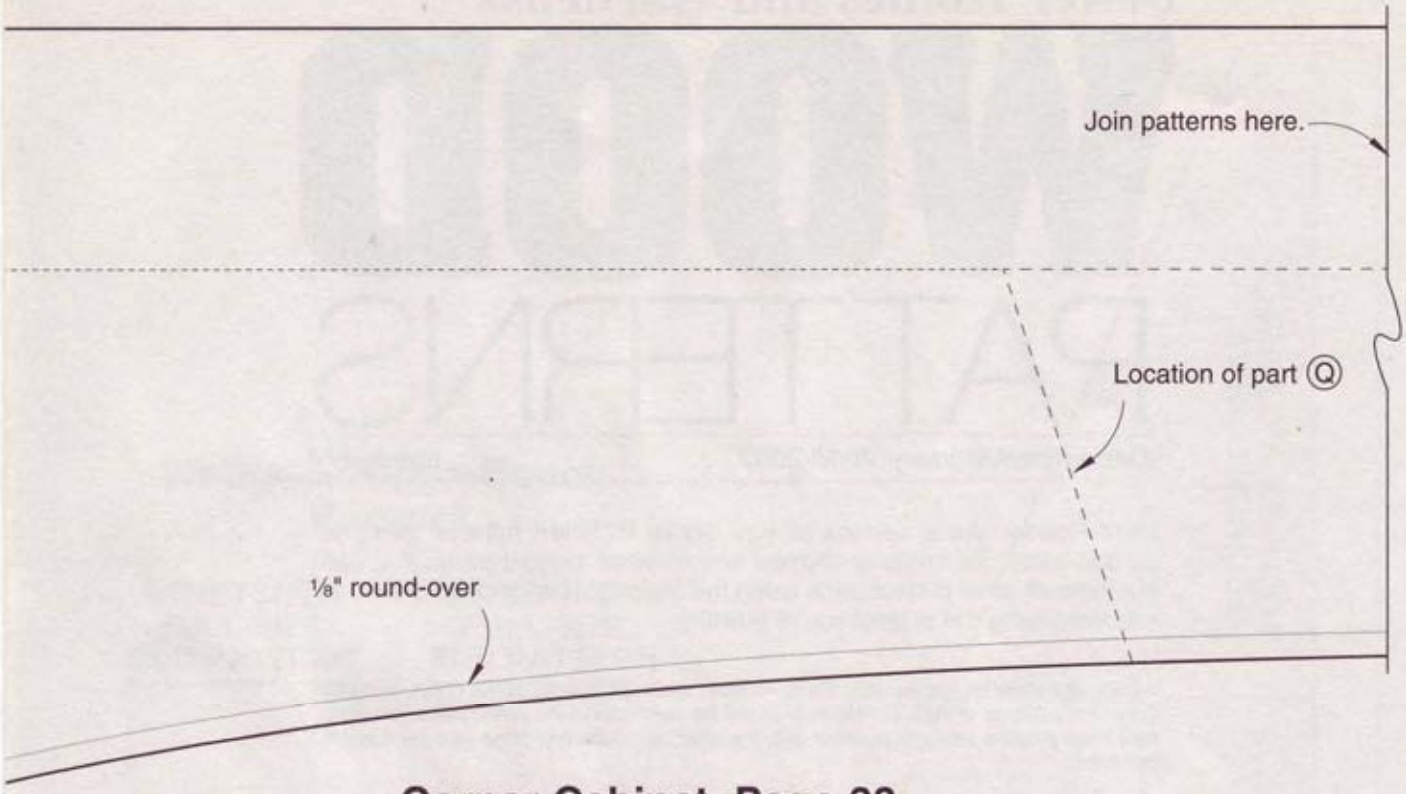
Bracket Clock, Page 73

Wine Box, Page 54

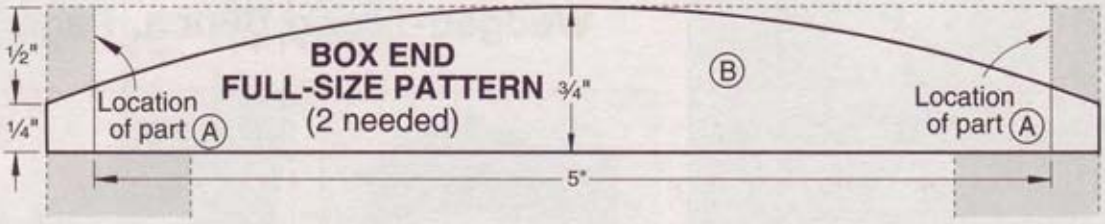

Location of part (M)
(N)
RAIL
FULL-SIZE
HALF-PATTERN
(2 needed)
7"
Location of part (L)

Wine Box, Pag


¼" hole drilled after assembly
½"



Corner Cabinet, Page 38



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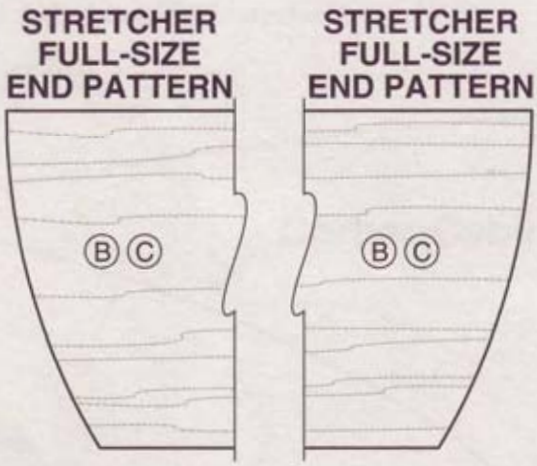
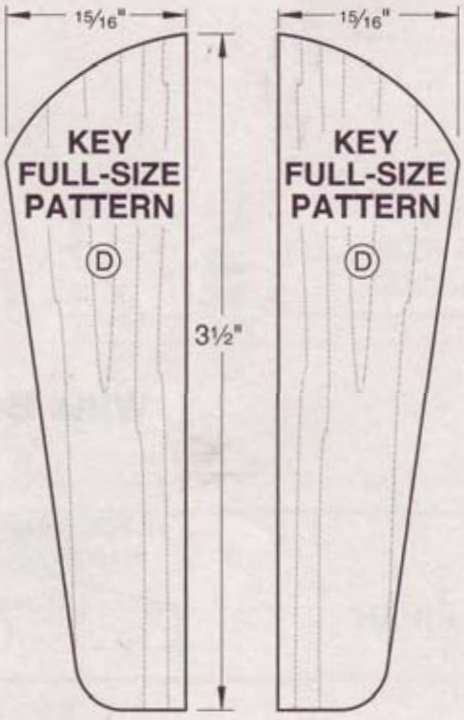
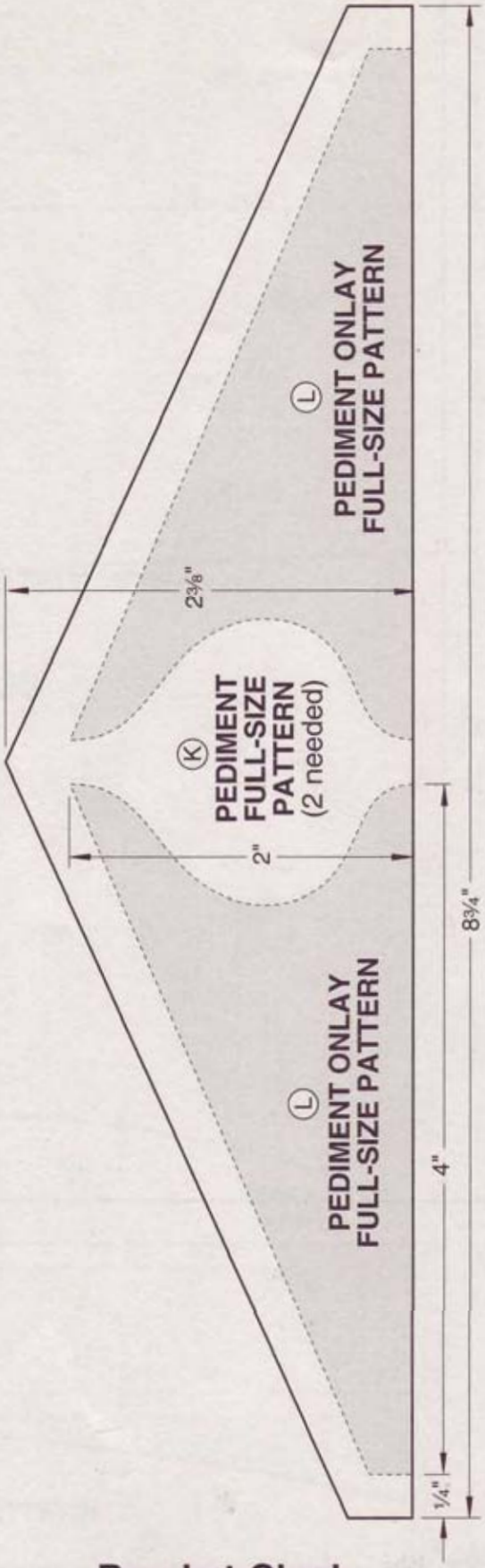
Wedged-Tenon Bench, Page 78

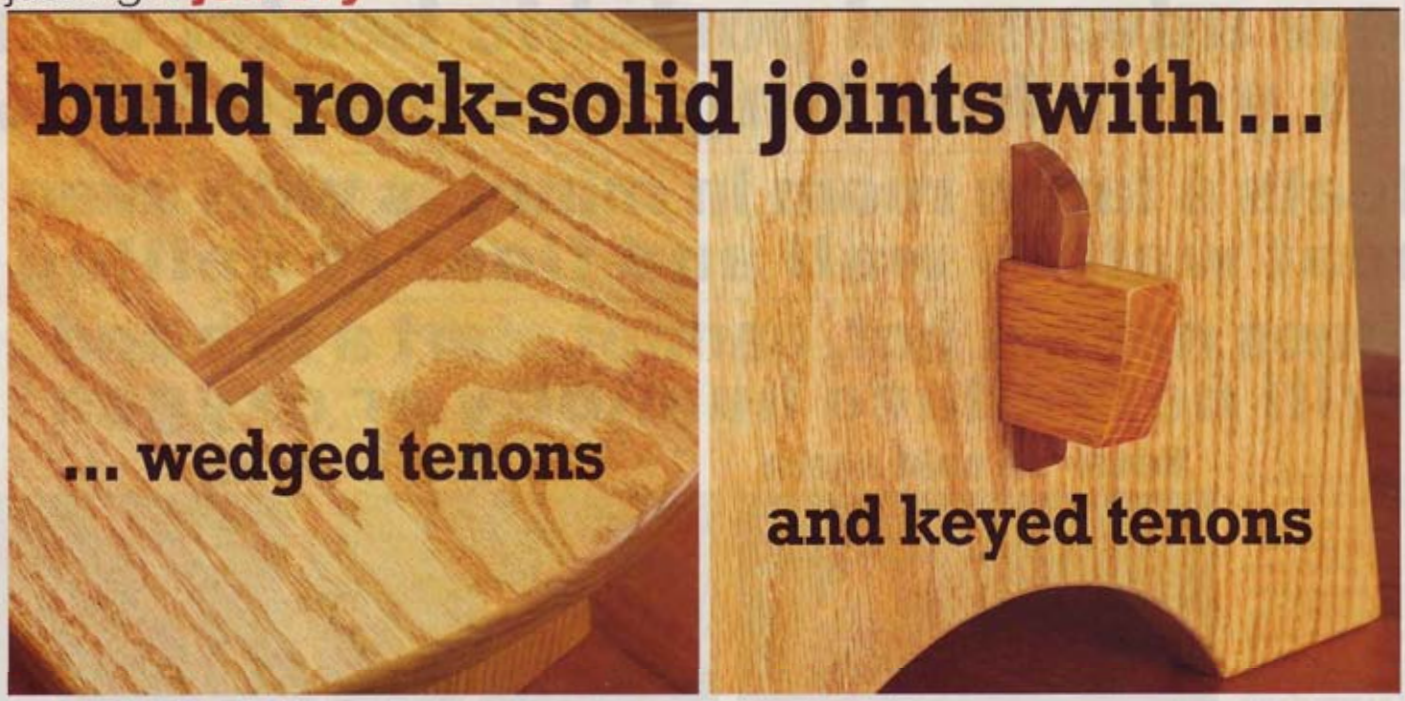






Bracket Clock, Page 73

build rock-solid joints with...



Besides fortifying mortise-and-tenon joints, these two variations add visual interest to your projects.

Tight mortise-and-tenon joints ensure wobble-free projects, but the parts still must fit loosely for assembly. Wedges and keys take that slack out of these joints by adding mechanical strength. Within the wedged through-tenon, the wedge spreads the tenon cheeks tightly against the mortise walls, strengthening the glue bond by effectively clamping from the inside out. In wedged tenons, a wedge-shaped key driven into a mortised through-tenon pulls the tenon shoulders tightly against the surface around the mortise.

Because these joints represent variations on basic mortise-and-tenon joints, we'll focus on making just the distinctive wedge and key features, not the complete joint, using the bench project on *page 78* as an example. Let's start with the wedged tenon that locks the bench legs to the seat.

Add a wedge to make a tight-fitting tenon

After machining the tenon, set your tablesaw blade height to ⅛" less than the length of the tenon. Then saw a groove centered on the end of the tenon, as shown in the bench project article. We like to use a tall auxiliary fence and push block to safely perform this operation.

The grain of the wedge should run perpendicular to the grain of the tenon. So start with a wedge blank longer than the width of the tenon and thicker than the groove depth. Then tilt your tablesaw blade 5°, and adjust the fence so the narrow part of the wedge matches the width of your saw kerf, as shown ❶.

Note: *Set up the cut so the wedge is not trapped between the rip fence and the blade, creating a dangerous "trapped missile" situation. Use a blank long enough to prevent the wedge from slipping between the factory insert and the blade.*

Rip the wedge off the blank.

Next, use the tenon to mark the wedge length, as shown ❷, and cut it to size. Glue and insert the tenon into the mortise. Then apply glue to the sides of the wedge, and place it in the tenon groove. Using a wooden mallet or dead-blow hammer, tap the wedge firmly into the groove, as shown ❸, working carefully to avoid splitting the wedge. Allow the glue to dry before flush-cutting and sanding the wedge even with the end of the tenon.

continued on page 96

The key to strong joints: keyed tenons

As with the wedged through-tenon, you'll make the keyed mortise-and-tenon joint by modifying only the tenon. To avoid breaking the tenon as you work, cut the angled mortise to match the key before machining the tenon to its final size.

To save time, first drill out the waste area in the angled tenon mortise. Angle the mortise 8° to match the shape of the key by tilting your drill-press table 8°. A scrapwood gauge block cut with an 8° angled edge simplifies adjustments, as shown ❶. Hold the gauge block end against the drill-press table, and tilt the table until the angled edge is parallel to the ⅜" bit you'll use to start the mortise.

Lay out the mortise on both edges of the workpiece using the pattern from the *WOOD Patterns*® insert for the bench or one of your own design. Adjust your drill-press fence to center the ⅜" holes on the edges, and bore at least halfway through your workpiece. Repeat until you've drilled the length of the tenon mortise; then rotate and flip the workpiece to drill the opposite edge, as shown ❷.

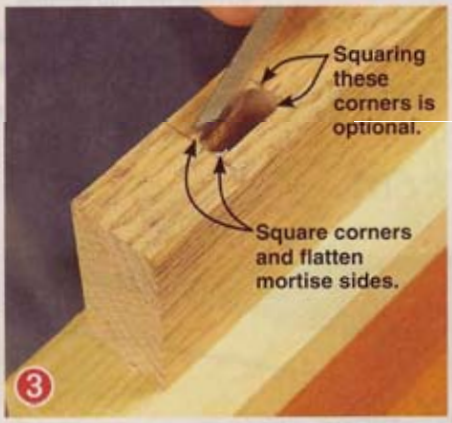
To protect your chisel and workbench against accidental slips, place a softwood scrap beneath the mortise. Then square up the mortise by chiseling out waste at the corners farthest from the end, as shown ❸. Squaring corners farthest from the end is optional because the key will not fit that far into the tenon mortise. As you clean up the mortise ends, use the scrap block with an 8° angle to guide your chisel, as shown ❹. Next, flatten the sides of the mortise until it fits a ⅜"-thick key. Then turn the workpiece and guide block upside down to square the mortise on the opposite edge, as shown ❺.

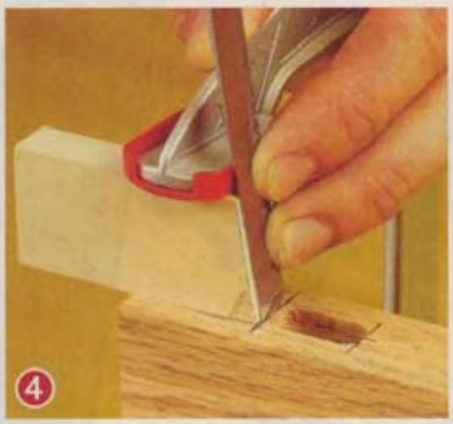
Once you've squared the mortise, cut the tenon to size. The example shown ❻ includes the *WOOD Patterns* template for cutting the curved end.

Cut and sand the key (also in *WOOD Patterns*) for a snug fit. You can make these joints with removable keys to disassemble a project, but we'll make this one permanent. Either way, insert the tenon through the mortise, and lightly hammer the key into place, as shown ❼, until the mortised piece pushes tightly against the tenon shoulders.

KEYED MORTISE-AND-TENON

The tenon mortise dips beneath the surface of the mortised part, allowing the wedge-shaped key to snug the pieces together.





shop-proven products

These woodworking wares passed our shop trials.

Drill Doctor heals dull, broken bits

As a woodworker for more than 35 years, I understand the value of working with sharp tools, including drill bits. But I'll often throw away a dull bit—or hide it in the back of a drawer so I can "sharpen it later." (Yeah, right.) The good news: Later is now, thanks to the Drill Doctor XP Series.

Sharpening twist and split-point drill bits with Drill Doctor XP couldn't be easier: Insert the bit into the sharpening chuck, use the self-aligning feature to orient the bit and set the grinding depth; then turn the machine on, insert the chuck into the sharpening port, and rotate it. Within seconds (just a few rotations) the bit comes out sharp. If you want to put a split point on the bit to keep it from wandering, another port (not visible in the photo) handles that task with just a single rotation of the chuck.

To test Drill Doctor's proficiency, I scrounged up a variety of dull drill bits and tried to drill into some scrap steel with each. Man, were they in sorry shape! After a few turns through Drill Doctor XP, though, each cut into the steel like a new bit. Same thing when I tried them in hard maple: clean entry and fast cutting.

I found that broken bits sometimes didn't sharpen completely on the first try. No worries: I simply reset the bit in the chuck as if it were a dull bit, and the second sharpening finished the task. In less than an hour, I put a fresh edge on two handfuls of bits, from high-speed steel to titanium-coated to cobalt to carbide masonry bits.

Drill Doctor XP sharpens to the standard 118° relief angle, but you also can adjust about 30° either way to make your bits more aggressive or to cut more precisely. It works with bits from 3/32" to 1/2" out of the box, but you can get an accessory chuck for bits up to 3/4". However, it can't sharpen brad-point or bullet-point bits.

Drill Doctor XP Series

Performance	★★★★★
Price	$100

Drill Doctor
800/597-6170; drilldoctor.com

If you own one of the original Drill Doctor sharpeners from about 10 years ago, you'll get two big improvements by upgrading: a quick-change diamond grinding wheel, and a vacuum port for sucking away the metal filings.

—Tested by Pat Lowry

SandBlaster pads throw hand-sanding a curve

Sanding curves and contours usually requires setting aside power-sanding equipment and tackling the job by hand. Even then, sandpaper alone doesn't conform well to curved surfaces, and the paper tears easily.

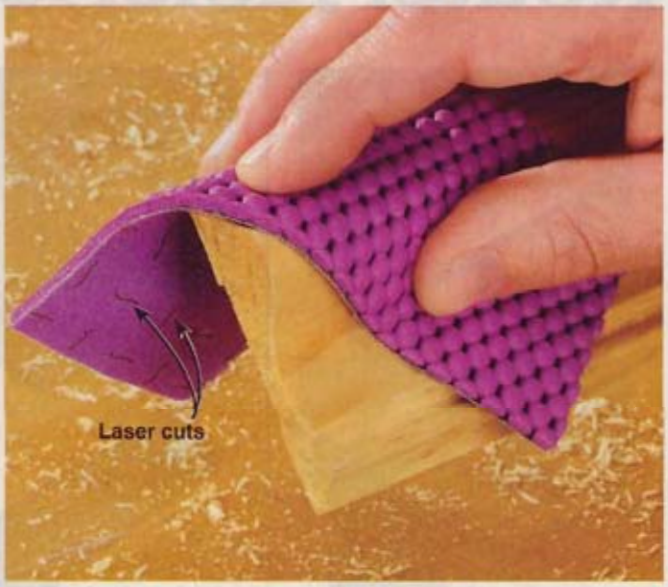
Recognizing these shortcomings, 3M engineers fused cloth-back abrasives to a foamlike backer. (Think of the rubbery, woven, pad some woodworkers use to keep a workpiece from sliding when routing or sanding.) The result is the SandBlaster Flexible Sanding Pad: an abrasive that conforms nicely to contours. To make the cloth-backed part more flexible, practically invisible laser cuts snake through the backing. The effect is similar to scoring a tough piece of meat to tenderize it.

How well does it work? After routing round-overs and an ogee edge profile on an oak project I was building, I sanded those curved surfaces with a Flexible Sanding Pad. It conformed well when getting into the profiles and tight corners.

I also used the pad to sand the broad, flat surfaces of my project, and it did a good job of smoothing planer knife marks. The abrasive sanded evenly and left a finish more like 150 grit than the 120 grit it's labeled as. I never felt like the sanding surface loaded up, and when I was done, a couple of quick taps cleaned the pad so well, it looked like I'd never used it.

3M's product literature says the Cubitron abrasive lasts seven times longer than ordinary sandpaper. I couldn't confirm that number, but I've used the same pad for several days now, and it feels like it still has a long life ahead of it.

—Tested by Steve Feeney



SandBlaster Flexible Sanding Pads

Performance	★★★★★
Price	$5 (3-pack)

3M
800/494-3552; 3msandblaster.com

To test the cutting speed and quality of carbide blades versus other types, we created this jig to pull a piece of poplar into the blade with consistent pressure while timing the cut.

carbide-tipped bandsaw blades

A premium price buys you smooth cuts time after time.

Equipped with a quality blade, a bandsaw has a much better chance to deliver a clean cut. And when it comes to long life, carbide-tipped bandsaw blades have the same wear-resistance of carbide cutting edges on circular saw blades and router bits.

Each tooth is brazed and sharpened individually, no small task on a 142" blade with three to four teeth per inch, like those we tested. That's nearly 500 teeth to be soldered, sized, and sharpened, which explains why carbide blades cost more than carbon-steel or bi-metal blades. But the spring-steel band holding those teeth differs little from less expensive blades.

Some carbide blades last up to 15 times longer than carbon-steel blades. The types of wood you cut, the size of your bandsaw wheels, and other variables affect how long a carbide-tipped blade will last versus a high-carbon steel or bi-metal blade. (See the chart on *page 96*.) But we can show you what to expect in the way of cutting speed and smoothness.

The resawing champ

To compare the resawing power of carbon-steel, bi-metal, and carbide blades, we equipped an 18" bandsaw with a carrier, shown *above*, that applies uniform pressure as it pulls 8"-wide, 18"-long pieces of wood into the blade. We then timed five cuts each in poplar and maple, and averaged the times as shown in "Bandsaw-blade metals with mettle."

Unlike blades where the set of the teeth determines the kerf, carbide-tipped teeth are wider than the blade body. So we first suspected those teeth might slow cutting times. Not so. Timed tests showed the carbide sliced through poplar and maple just as fast as the carbon-steel blades.

Although the bi-metal took more than twice as long to make the same cuts as the other two blades, that less-aggressive cutting speed left a smoother surface than the carbon-steel blade. For ripping plywood and cutting patterns in MDF or particleboard, bi-metal blades hold their edges longer than carbon-steel blades (but are not as smooth as carbide).

Is carbide right for you?

The answer depends on the size of your saw, your needs, and your budget. Saw size affects blade life because smaller wheels require greater flexing, which shortens blade life. Wheels larger than 14" accept wider blades— ¾" to 1¼" for most mid-priced bandsaws—which also are thicker to resist flexing stress. (See "Make any bandsaw blade last longer," *below*, for more budget-stretching tips.)

If you often resaw such dense hardwoods as maple, a carbide-tipped blade at least ½"

Make any bandsaw blade last longer

To protect your bandsaw blade investment, take these precautions:

- When installing or removing a carbide-toothed blade, avoid striking the teeth against metal parts of the saw.
- Constant tension distorts the blade shape and shortens blade life. Relax the tension once you're finished.
- When resawing recycled lumber, use a metal detector to check for nails and hardware hidden beneath the surface.
- After each blade change, and periodically during use, check that the blade teeth clear the guide blocks or wheels.
- Use the widest blade possible for your cuts. Save the less durable ⅛" and ¼" blades for cuts with tight turns.

continued on page 106

Bandsaw blade metals with mettle

	Sample Cut	Blades Tested
Carbon Steel		**Blade:** Lenox Flex Back (no. 88266-FLB11-36) high-carbon steel blade **Price:** $27.35* **Kerf:** .064" **Maple cutting time:** 1 minute 15 seconds **Poplar cutting time:** 1 minute 24 seconds **Cut quality:** Acceptable (All cuts shown are in poplar.) **Comments:** The tooth shape cuts quickly and leaves a surface that needs only light planing.
Bi-Metal		**Blade:** Lenox Classic (no. 81062-CLB11-36) bi-metal blade with teeth cut into a strip of high-speed steel welded to a medium-carbon steel band **Price:** $53.31* **Kerf:** .060" **Maple cutting time:** 3 minutes 42 seconds **Poplar cutting time:** 3 minutes 21 seconds **Cut quality:** Good **Comments:** High-speed steel teeth handle the heat of resawing better than carbon-steel blades. They're also hard enough to survive abrasive materials such as particleboard.
Carbide-Tipped		**Blade:** Lenox Tri-Master (no. 48513-TRB11-36) with C2 carbide-tipped teeth on a medium- to low-carbon steel band **Price:** $232.47* **Kerf:** .065" **Maple cutting time:** 1 minute 14 seconds **Poplar cutting time:** 1 minute 35 seconds **Cut quality:** Excellent **Comments:** Hard enough to cut stainless steel, carbide-tipped blades slice through hardwoods and sheet goods with ease. Deep gullets clear away chips for faster cuts.

(*All prices are for 93½"-long, ½"-wide blades.)

wide cuts quick and clean day after day. From our experience in the *WOOD*® magazine workshop, these same blades make saws perform more effectively and shorten resawing times.

But if you rarely resaw, or if you bandsaw shapes that include tight turns requiring narrow bands, carbon-steel blade prices let you afford several blades of different widths and tooth spacings.

When cutting plywood, particleboard, or MDF, save money by going with a bi-metal blade. You'll get a smooth cut, though it might take a little longer than when using a carbide-tipped blade.

Carbide bandsaw blade sources:

Lenox, 800/628-8810 or lenoxsaw.com; Grizzly Industrial, 800/523-4777 or grizzly.com; and Timberwolf 1"-wide blades, Suffolk Machinery Corp. at 800/234-7297 or suffolkmachinery.com.

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what's ahead

A sneak peek inside the March issue (on sale January 16)

Projects big and small

FEATURED PROJECT

Blanket chest

Expect this deceptively simple project to become a family heirloom. Straightforward stub-tenon-and-groove joinery speeds assembly, as will the bun feet you can buy (or choose to turn yourself). Find the aromatic cedar closet lining at any home center.

Tip-shape top

Here's a quick lathe project worth taking a spin at. You'll even discover a chatter-tool technique you can try on other turnings.

Low-dough portable mitersaw stand

Looking for a place to put your saw that has the features of commercially made stands without the hefty price tag? Your search is over.

Plant pedestal

Learn to steam-bend wood as you build this sleek accent table. All you need: six parts and a few screws.

Improve your tool savvy and woodworking skills

TOOL REVIEW

Through dovetail jigs

Have you been wanting to cut through dovetails in your projects? Consider the findings and recommendations from our test of dovetail jigs before buying one.

Let grain reign

How you choose, machine, and glue up boards will make all the difference in how well the grain patterns enhance your project's final appearance.

Steam-bending basics

Come along as master chair-maker Russ Filbeck shares his tips for curving solid-wood parts.

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WOOD MAGAZINE

BEST ROUTER JIGS & TIPS

13 shop-tested routing tricks

Easy-does-it biscuit joinery

- FENCES
- TEMPLATES
- ORGANIZERS
- SAFETY TIPS

Supplement to WOOD Magazine

Letter from the Editor

Thanks for subscribing to WOOD® magazine. Whether you're new to the magazine or a long-time subscriber, I want to take this opportunity to thank you for your business, and to tell you about our commitment to providing you with the very best woodworking magazine available.

On the table of contents in every issue of the magazine you'll find our vow to "build every project, verify every fact, and test every reviewed tool in our workshop to guarantee your success and complete satisfaction." To carry through on this pledge, one or more of our staff craftsmen test and prove every step in every project, every dimension in every drawing, every claim in a tool review, plus hundreds of other details in every issue. This approach is what separates us from our competitors. It's costly and time-consuming, but it's the only way to guarantee your success in everything we show and tell you.

If we ever fail to meet your expectations, let me know immediately, okay? Just contact me by any of the means listed in every issue of the magazine. I promise we'll deal with your issue immediately.

Bill Krier

WOOD Magazine's

BEST ROUTER JIGS & TIPS

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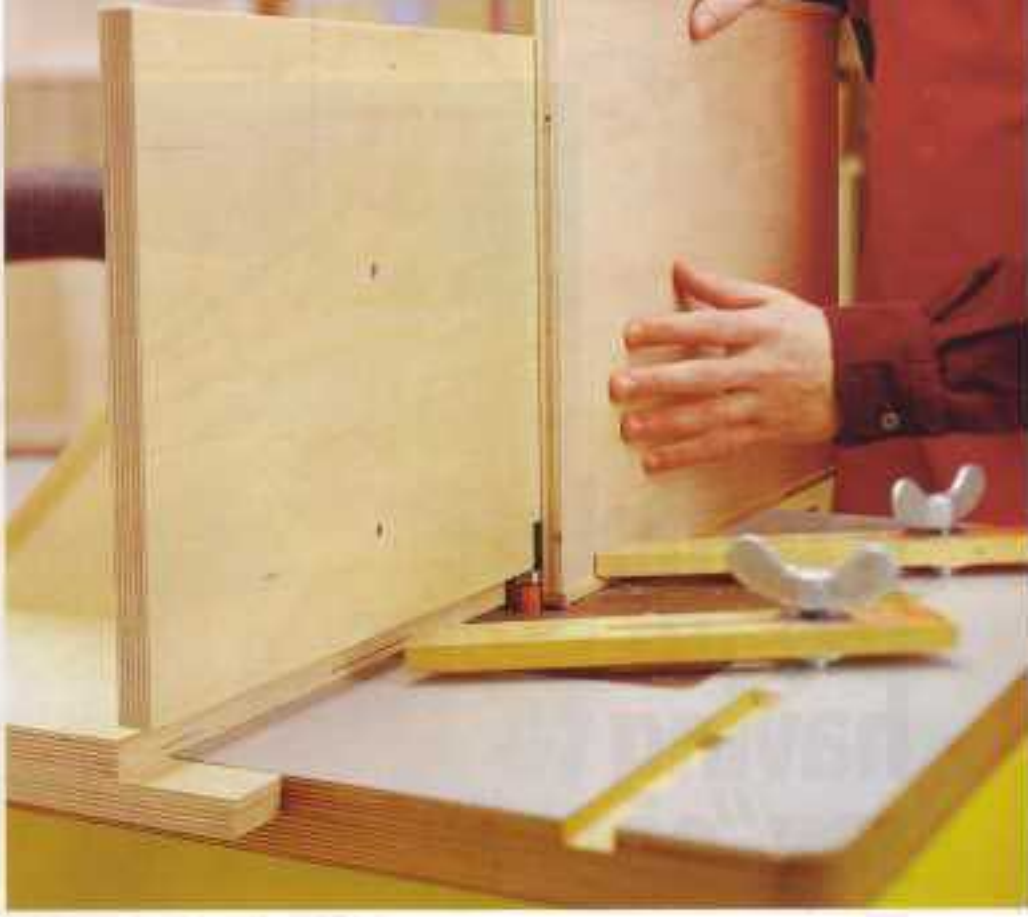
Flush-trimming fence



While building a dresser, project builder Chuck Hedlund had to do a lot of flush trimming on the solid-wood edging that dresses up the plywood panels. He needed a foolproof way to get the job done. A handheld router with a flush-trim bit would work, but it's easy to accidentally tip the router and gouge the edging and plywood. Chuck solved the problem with the router-table-mounted fence shown in the photo *above right*.

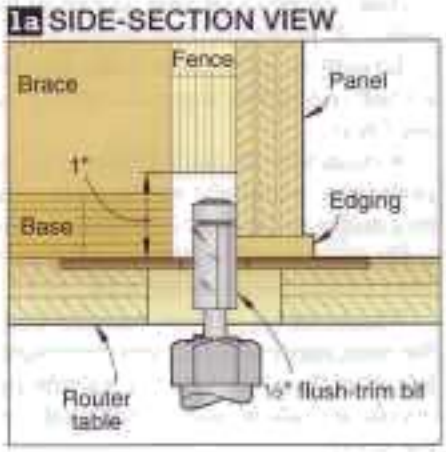
Made of ¼" plywood, the fence sits perpendicular to the table, as shown in **Drawings 1** and **1a**. The lower edge of the fence is mounted 1" above the router table surface, so the fence accommodates edging up to ¾" thick.

To build the project, cut its identically sized fence and base to 11¾" wide. Measure the top of your router table to determine the length. Cut matching notches into the base and fence, positioned to align with the bit hole in your table. Two triangular braces hold the base and fence together. The cleats at each end help position the assembly on your router table.

Chuck also added a support panel to the braces, stiffening the entire assembly. A hole cut into the support accepts a shop-vacuum hose to collect chips.

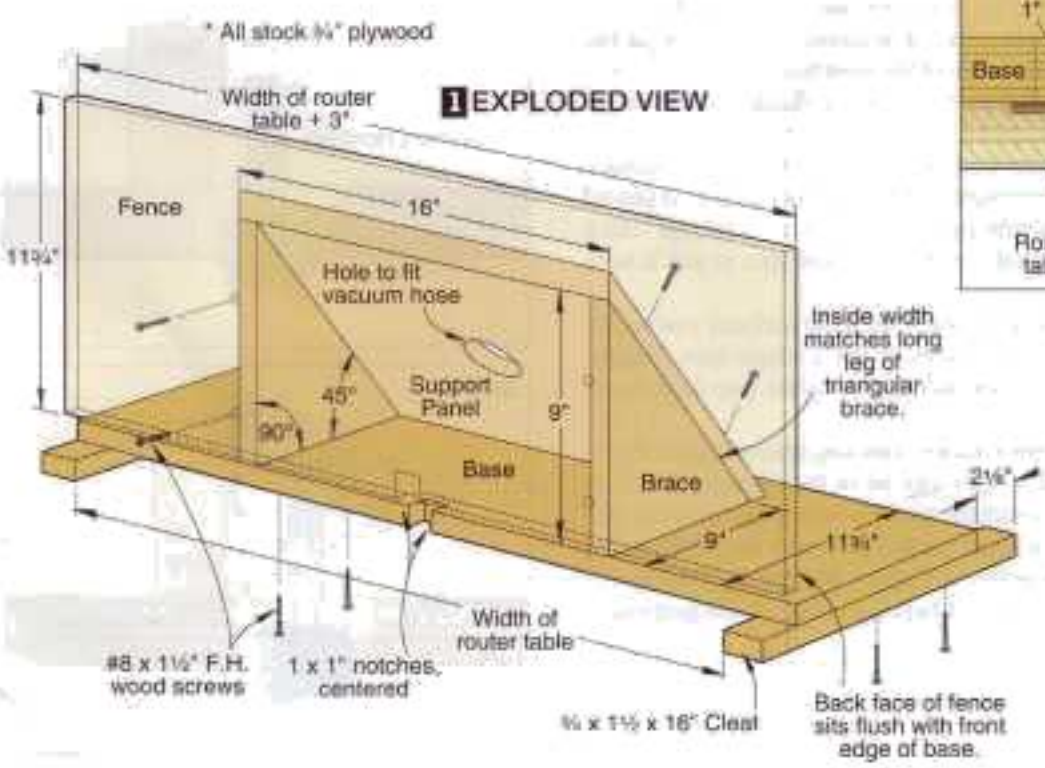
To use the fence, install a flush-trim bit in your table-mounted router. Align the fence face flush with the bit's pilot bearing and clamp the fence down. Hold the edged plywood firmly against the fence as you make each pass, and the edging comes out perfectly flush every time.

1a SIDE-SECTION VIEW



* All stock ¾" plywood

1 EXPLODED VIEW



A template means never having to say "oops"

Cut the workpiece close to your template with a bandsaw before going to the router table. Trim bits are designed to handle light cuts only.

Let's say you want to make four table legs with matching curves. A table-mounted router and template enable you to produce as many identical legs as you want.

Using ¼" hardboard or medium-density fiberboard, make a template to the shape you want. Use a bandsaw or scrollsaw to cut close to the line, then sand right up to it. Attach the template to your stock with cloth-backed double-faced tape, orienting the grain for best effect. Bandsaw within ⅛" of the template, all the way around.

Turning to your router table, you have two choices for router bits—a flush-trim bit or a pattern-cutting bit. In some situations, you might need both.

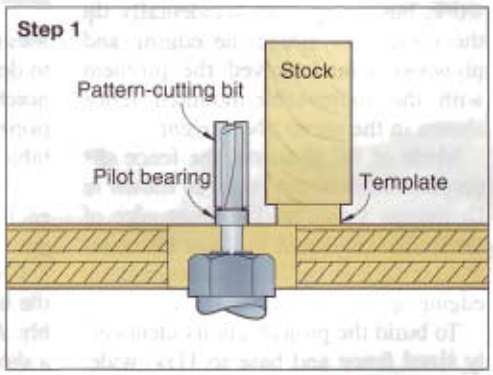
A flush-trim bit has a ball-bearing pilot mounted at the tip. To use it, place your workpiece on the table with the template on top. Adjust the bit's height so the pilot runs on the edge of the template.

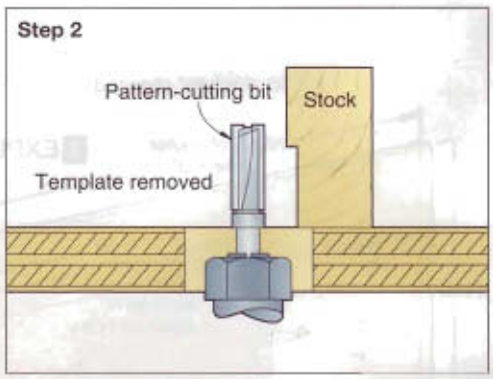
On pattern-cutting bits, the pilot sits between the shank and the cutter. Your template rests on the table.

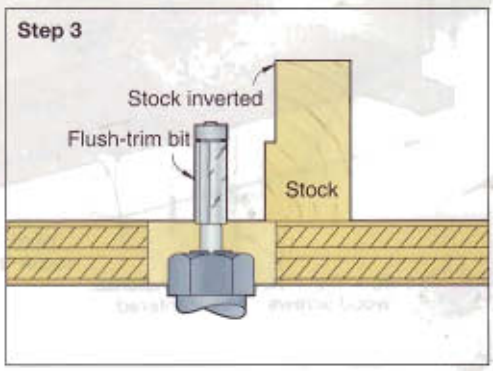
Whichever bit you use, ease the workpiece into the bit until it contacts the pilot, then move the piece from right to left, as shown *above*. If you've left more than ⅛" of excess material in some spots, trim it to size with a couple of shallow passes. Don't pause too long in any spot or you'll burn the wood.

Before you remove the template, double-check the surfaces you've just routed. Sometimes, another pass will smooth out a rough spot. Finally, slide a putty knife blade between workpiece and template, pop them apart, remove the tape, and you're done.

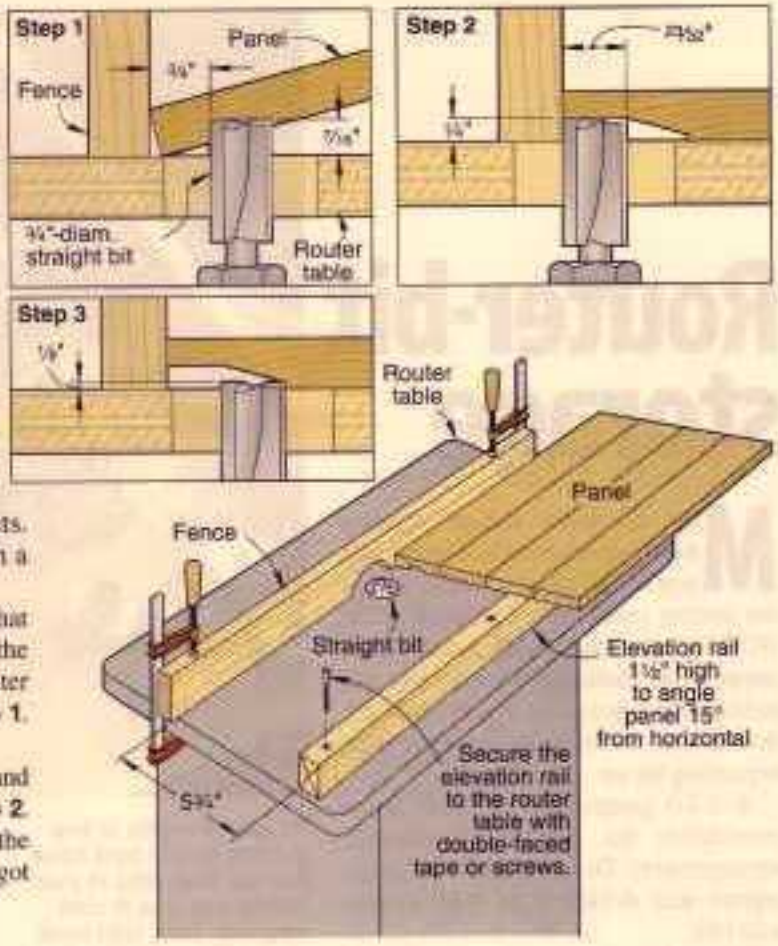
When you have a workpiece that's thicker than the cutting length of your bit, use a pattern-cutting bit and a flush-trim bit in sequence, as shown in **Steps 1**, **2**, and **3**. Make one pass with the pattern-cutting bit, template side down. Remove the template, then make another pass with the pilot bearing riding on the surface you just machined. Finally, flip the workpiece over and use the flush-trim bit, with the pilot bearing riding on the previously milled surface.







Rout raised panels with a straight bit

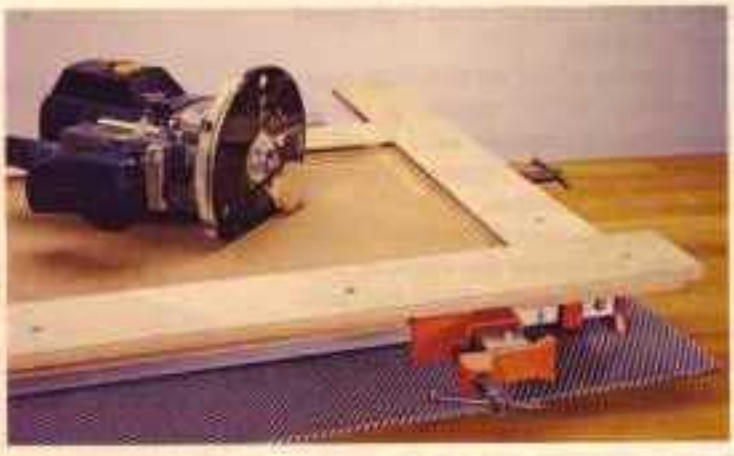


For a low-cost way to make raised panels, try using a straight bit and an elevation rail on your router table. Use a bit with a bottom-cleaning profile, as you find on hinge-mortising bits. These will leave you with less sanding to do than with a regular straight bit.

Start by positioning the fence and elevation rail so that your panel tilts at a 15° angle, as shown in the drawing of the router table at *right*. Secure a ¾" straight bit in your router and adjust the height to make the cut, as shown in **Step 1**. Make this cut along all four edges of the panel.

Now, remove the elevation rail, move in the fence, and make the flat cut along all four edges as shown in **Step 2**. Move the fence back out and lower the bit to clean up the shoulders with the cut as shown in **Step 3**. Now, you've got a raised-panel profile that measures almost 1½" wide.

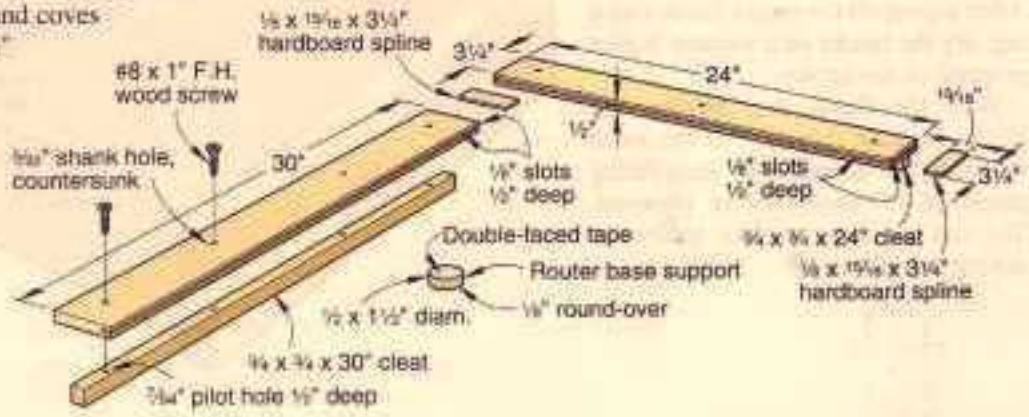
Real panels with a plunge



A router removes stock, so how can it *raise* a panel? Actually, plunging with a bearingless bit into the field of a flat panel creates the illusion of frame-and-panel construction. Note that this technique is limited to making raised panels with medium-density fiberboard (MDF), that you plan to paint, rather than clear-finish.

The panel-routing guides, shown at *right*, amount to a simple frame with splined corners that let you adjust the frame to a variety of panel sizes. Cleats on the back of the frame capture the panel. And to keep the router from tipping toward the field and ruining the cut, we taped a small disc, the same thickness as the guides, to one corner of the router's base with double-faced tape.

We made these cuts with a plunge-ogee bit, but you also could use a bearingless ovolo or plunge bead bit. You also can create bevels and coves up to 1½" wide with bigger, 3½" raised-panel cutters, but these are best used in a router table.



Router-bit storage

Most router-bit storage systems force you to guess how many bits you'll add to your collection in the coming years. Dave Campbell of the *WOOD®* magazine staff neatly sidestepped that challenge by designing this modular storage system that fits into any drawer and easily grows to meet your expanding bit set.

A 1-2-3 progression of block sizes maximizes the number of possible arrangements. Dave set aside one large square and drilled it to hold rotary-tool bits.

To build your modular storage, rip ¼" medium-density fiberboard (MDF) into 1¼"-, 2½"-, and 3¾"-wide strips, then crosscut them into squares. For easy bit removal, drill centered, slightly oversize holes: 17/64" and 13mm holes for ¼"- and ½"-shank router bits, and 7/64" and 9/64" holes for 3/32"- and ⅛"-shank high-speed rotary-tool bits.

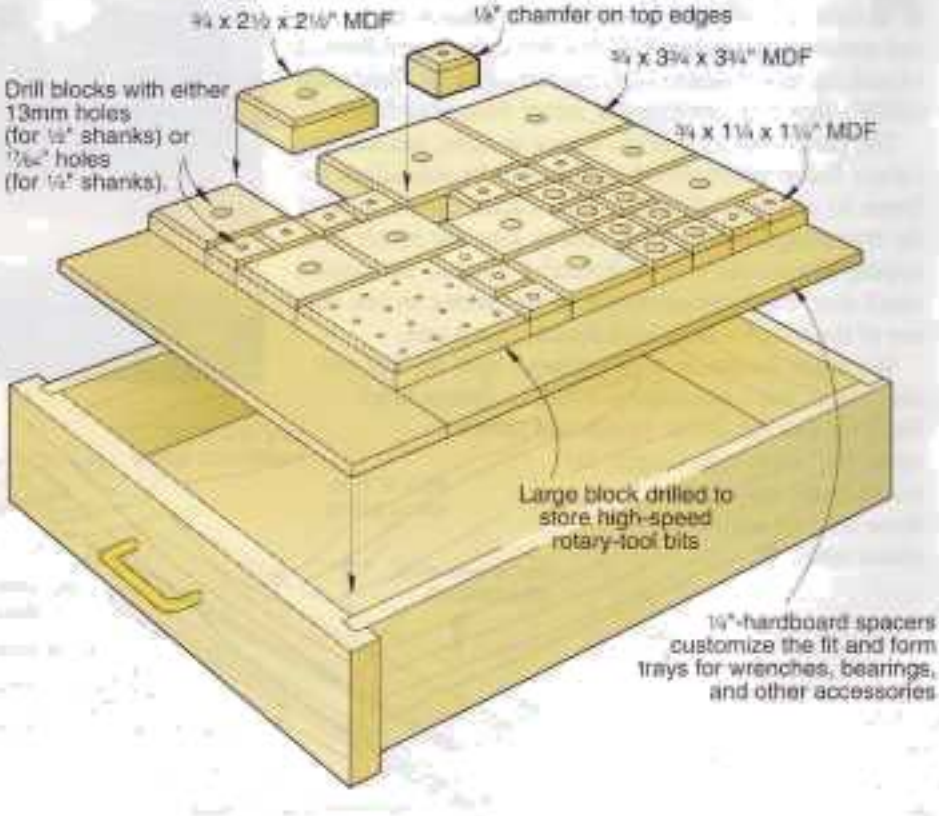
***Tip:** Finding a 33/64" bit to drill the oversize holes for ½" shanks is nearly impossible. Commonly used to install metric hardware, a 13mm bit is a readily available substitute.*

Slightly countersink the holes' edges. Chamfer the blocks' top edges on your table-mounted router. Hold the parts with a padded jointer pushblock to keep your fingers safely away from the router bit.

Pour some Danish oil-type finish into a small container and dip the blocks. After wiping off the excess finish with a rag, dry the blocks on a window screen propped on sawhorses.

With the finish dry, arrange the blocks in your drawer. Fill the extra space in the drawer with snug-fitting pieces of ¼" hardboard or plywood. You can use these traylike spaces for storing accessories.

To add versatility to this system, simply bore holes into the module(s) of your choice and glue in craft magnets. They hold small steel parts just great. Our thanks to Jeff Hilton of Mission Viejo, California, for sending in this tip.

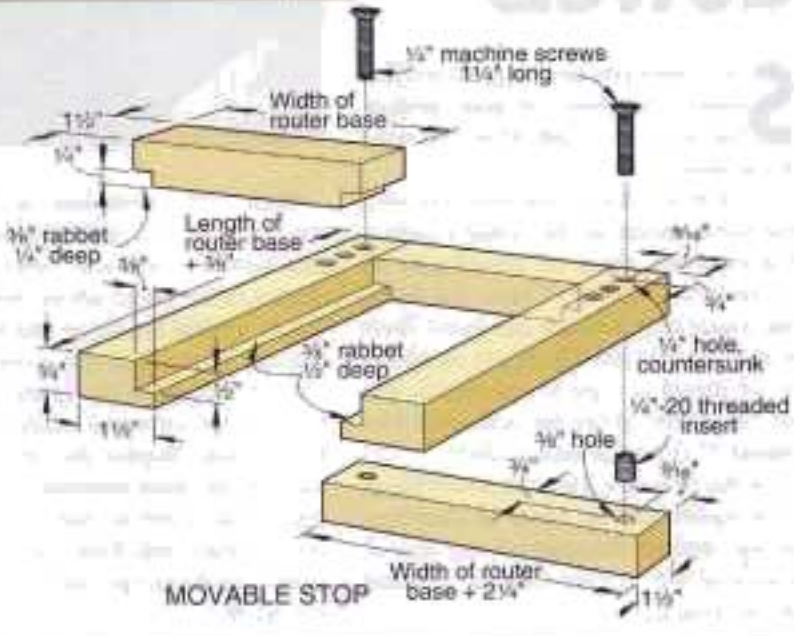

¾ x 2½ x 2½" MDF
⅛" chamfer on top edges
¾ x 3¾ x 3¾" MDF
¾ x 1⅛ x 1⅛" MDF
Drill blocks with either 13mm holes (for ½" shanks) or 17/64" holes (for ¼" shanks).
Large block drilled to store high-speed rotary-tool bits
¼"-hardboard spacers customize the fit and form trays for wrenches, bearings, and other accessories

Keyhole routing jig

A sturdy way to hang items such as picture and mirror frames, shelves, and plaques, keyhole slots can spell trouble if they aren't exactly the same distance from the top of the project. You can go nuts offsetting the wall hangers to compensate for the misalignment.

The keyhole-routing jig at *right*, devised by *WOOD*® magazine reader Don Thomas and modified by reader Luther Williamson, consists of a frame that fits your router's base. The router rides on the rabbets on each rail.

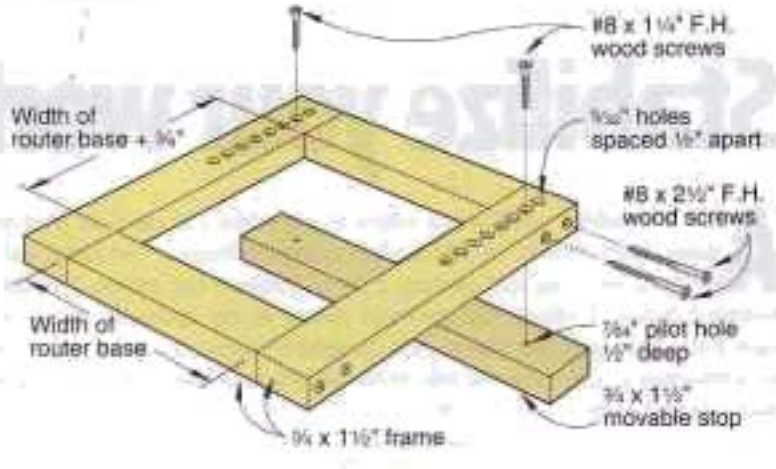
With the help of a movable stop, you can bore slots 6½", 7¼", or 8" from the top of the frame. After setting the stop, center and clamp the jig to one of the vertical frame pieces, place the router at the near end of the jig, plunge with a keyhole bit, slide it to the far end, then back out of the cut. Repeat the process on the other vertical frame piece.

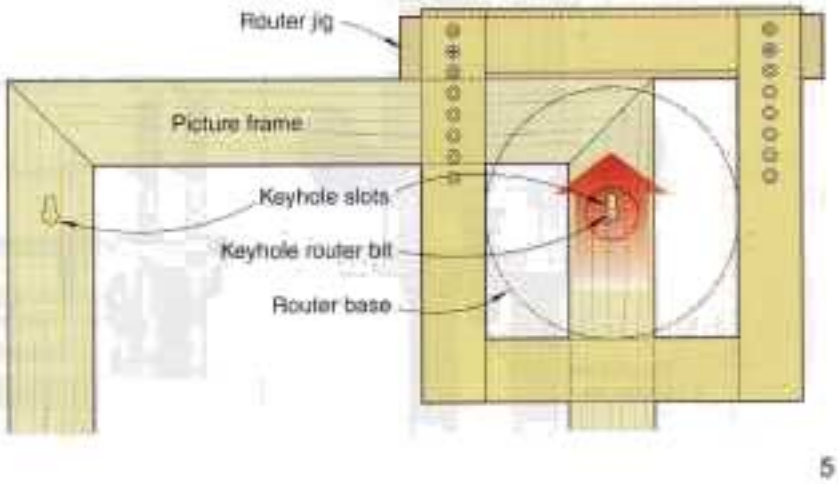


Matching keyhole slots

Aligning two keyhole slots on a picture frame or shelf used to frustrate Don Thomas of Defiance, Ohio. If the holes weren't the same distance from the top of the frame, Don found himself offsetting the wall hangers to compensate for the crooked keyholes.

To make the cuts consistent, he fashioned the jig shown at *right* from ¾" stock. The movable stop allows him to bore slots as far as 8" from the top of the frame. Once the stop is set, he simply centers the jig on one of the vertical frame pieces and clamps it in place. With his plunge router (with keyhole bit) in the near end of the jig, he plunges, and slides his router along the jig until it contacts the far end, then backs out of the cut. He then clamps the jig to the other vertical frame piece without moving the stop, and repeats the process.


#8 x 1¼" F.H. wood screws
Width of router base + ¾"
⅜" holes spaced ½" apart
#8 x 2½" F.H. wood screws
Width of router base
7/64" pilot hole ½" deep
¾ x 1½" movable stop
¾ x 1½" frame



Super-size dowels

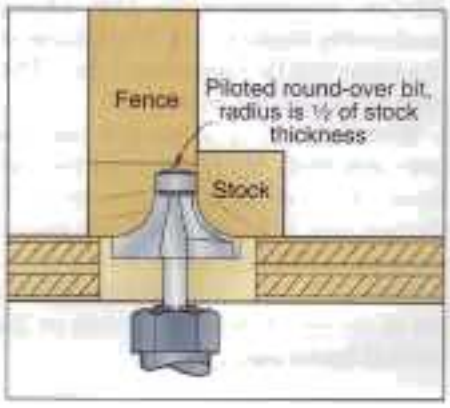
We raised the guard for clarity in this photo. Keep it low while you're making dowels, to ensure that your fingers stay well away from the router bit.

Sometimes you need big dowels that match the wood of your project, but you can't find what you need at the store.

You'll need a round-over bit with the same radius as the dowel's radius. For example, use a ½" round-over bit to make a 1" dowel. Chuck the bit in the router and position the fence flush with the pilot bearing. Apply two pieces of masking tape to the fence, one on either side of the bit, and mark two points 3" from the bit's center.

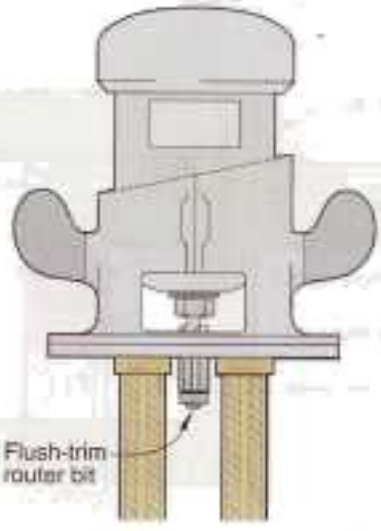
On the tablesaw, rip each dowel blank to a square profile equal in thickness to the desired diameter of the dowel. Crosscut it 6" longer than the finished dowel length.

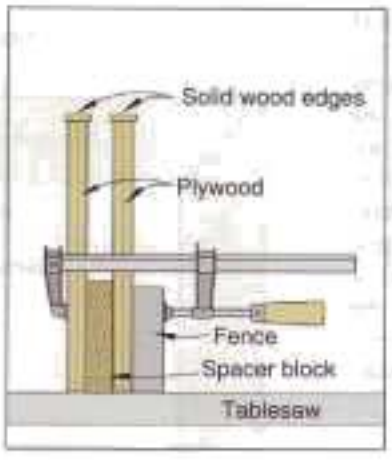
Place your workpiece as shown in the drawing at *right*. Align the left end with the left-hand fence mark, as shown in the photo *above*, hold the end firmly against the fence and begin routing any edge. Ease the workpiece into the bit and move the blank across the bit until the right end reaches the right-hand mark. Repeat the procedure for each of the three remaining edges. The flat surfaces left at each end not only prevent the blank from rotating but also keep your fingers at a safe distance from the bit.

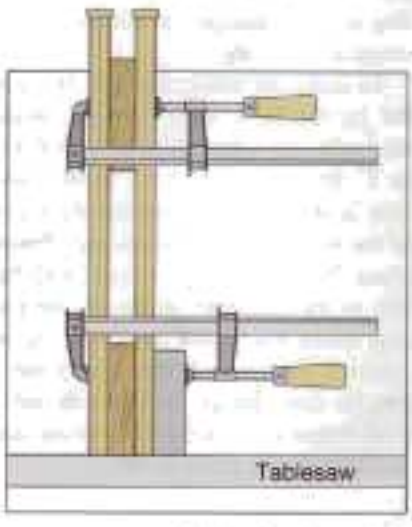


Stabilize your workpiece

"After I've added solid wood edges to plywood and need to trim them, I use a router with a flash-trim bit," states Karl Siefert, of Philadelphia, Pennsylvania. "To keep the router from wobbling on the ¾" edge or to avoid building and storing a jig to balance the router, I simply do two or more panels at a time. As illustrated *below*, I clamp the plywood pieces to my tablesaw fence, with a spacer piece of scrapwood between each pair. This way, the router sits, as shown *below*, on at least 2¼" of edge. To stabilize wider pieces, I clamp an additional spacer near the top. If the plywood is too large to clamp securely to the fence, I clamp it directly to the table and work sideways."



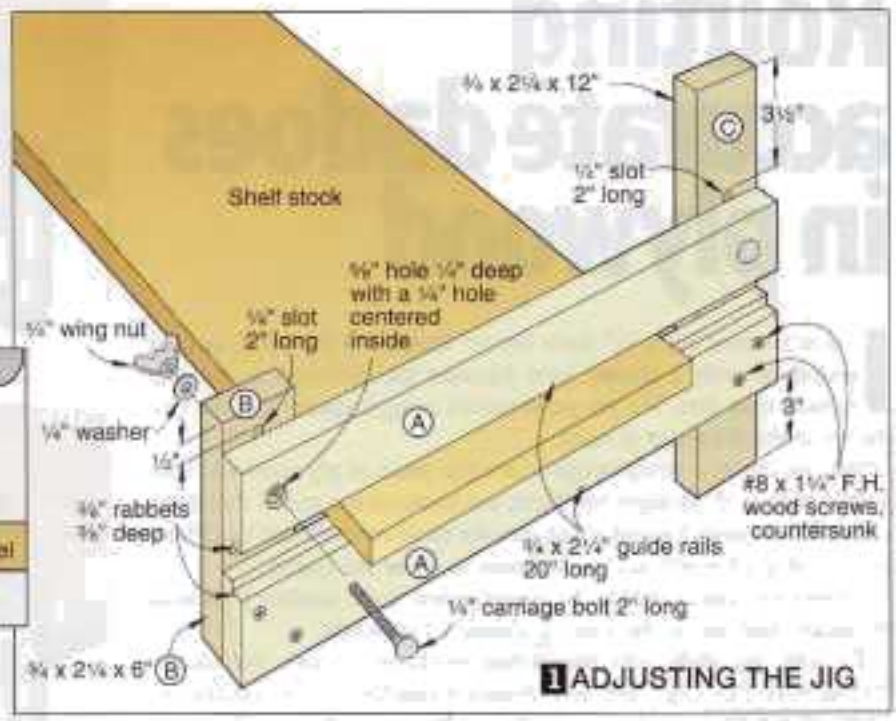




Exact-width dado jig

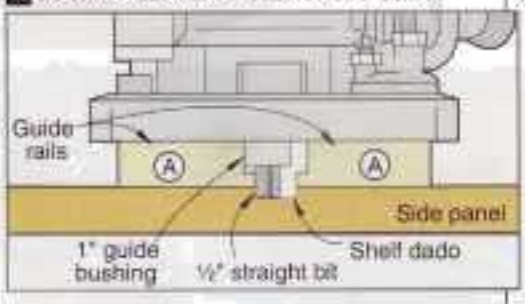
Here's a jig for routing bookcase or cabinet-side dadoes that exactly match the thickness of your shelf stock. Better yet, no special bits are needed. Just use an ordinary straight bit and a guide bushing. (We used a 1" guide bushing and a ½" straight bit.) To start, cut a ⅜" rabbet ⅜" deep along the inside edge of both guide rails (A). Then complete the jig as shown in **Drawing 1**. To customize the rails for a different bushing and bit, install them in your router and trim the protruding lip of the rabbet in the guide rails, as shown in **Drawing 2**. The remaining lip will now match your bushing/bit combo.

To adjust the jig for the exact width of your shelf stock, slip the jig over the shelf stock as shown in **Drawing 1**. Pull the guide rails (A) tightly against the stock and tighten the wing nuts. Slip the jig off the stock, and clamp the jig onto the piece being dadoed, centering the opening between the rails (A) over the marked dado on the side panel. Adjust the depth of cut with your router sitting on top of the rails. Start the router and make one pass, with the guide bushing riding against one of the rabbeted rails. Make a second pass, riding the bushing against the opposite rabbeted rail.


¾ x 2¼ x 12"
3½"
½" slot 2" long
Shelf stock
⅜" hole ¼" deep with a ¼" hole centered inside
¼" slot 2" long
¼" wing nut
¼" washer
½"
3"
⅜" rabbets ⅜" deep
#8 x 1¼" F.H. wood screws, countersunk
¾ x 2¼" guide rails 20" long
¼" carriage bolt 2" long
¾ x 2¼ x 6"

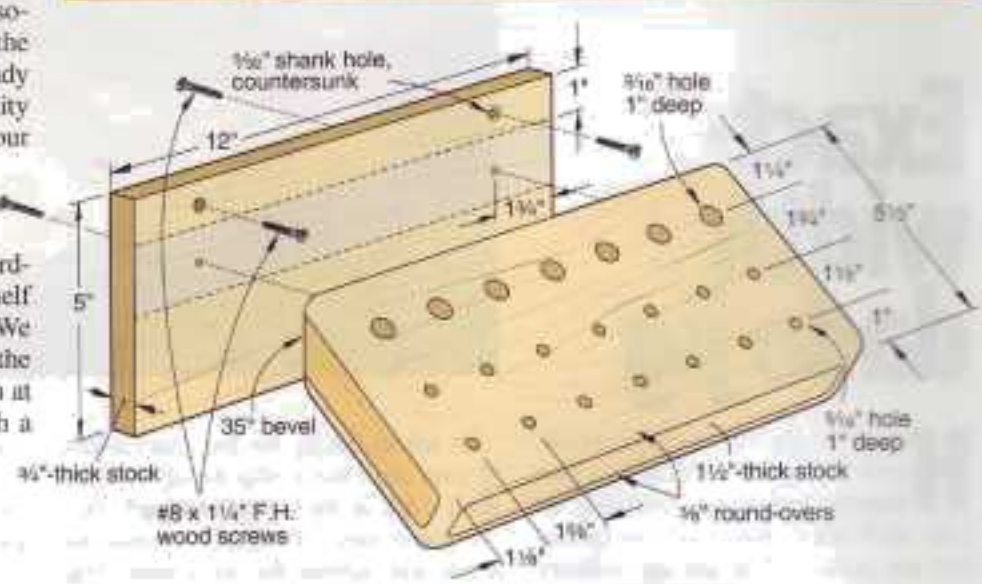
1 ADJUSTING THE JIG

2 DADO-DETAIL SECTION VIEW



At-the-ready bit shelf

Here's an easy-to-build organizer you can customize to hold as many bits and shanked accessories as you need by simply varying the length and number of holes in this handy project. Angled for better accessibility and visibility of your accessories, our shelves hold router bits, sanding drums, flap sanders, and other drill-press and shanked accessories from our shop. Use either thick hardwood or 2×6 stock for the angled shelf and ½" stock for the backboard. We routed a ⅜" round-over on all but the back edges of the shelf where shown at *right*, and finished each project with a clear finish.



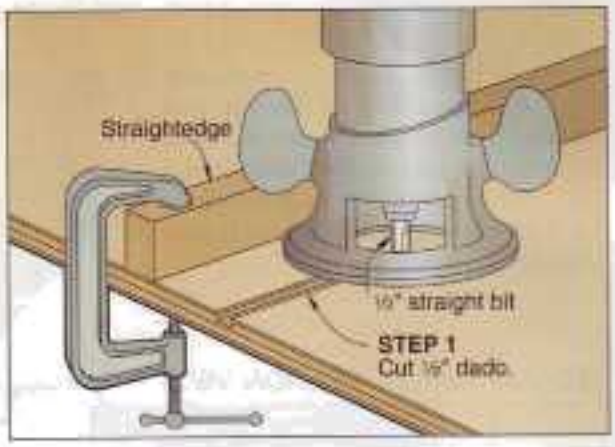
Routing accurate dadoes in plywood

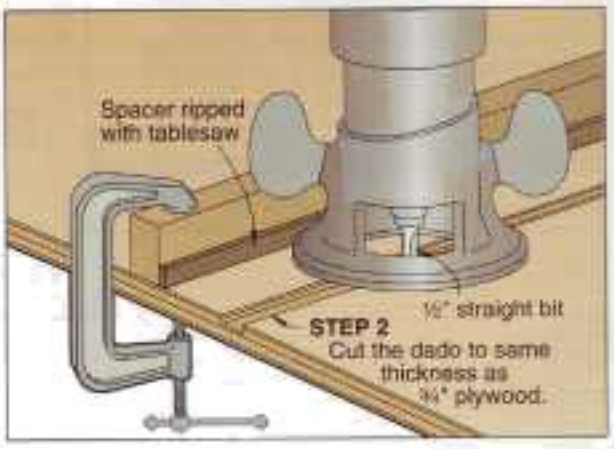
If you've ever cut a ¾" dado for ¾" hardwood plywood, you've ended up with a sloppy joint because the plywood is actually thinner than that. We get great results using a spacer like the one shown in the drawings at *right*.

First, we clamp a straightedge to a scrap piece of plywood and rout a dado with a ½" straight bit. Next, we measure the actual thickness of the finish-sanded wood going into the dado and subtract ½". Plane or rip a strip of wood to this thickness to make the spacer.

Laying the spacer next to the straightedge, make another pass with the router and test-fit the joint. It should fit perfectly.

To rout the dado into the actual workpiece, mark the dado's critical edge (the edge that must measure exactly) on the workpiece. Then, clamp the straightedge to the workpiece so that the first pass routs the critical edge. Finally, lay the spacer in place and make the second pass.





Sink your teeth into some biscuits

Biscuit joiners are great tools, but you also can do a lot of biscuit joinery right on your router table. All you need is a slot-cutting bit that matches the standard biscuit thickness of ⅛", and a miter gauge with an auxiliary fence.

Every time you set up to make a joint, center the cutter on the thickness of your stock and make a test cut to double-check. To further reduce the risk of misalignment, mark the face of each component, then keep that side up.

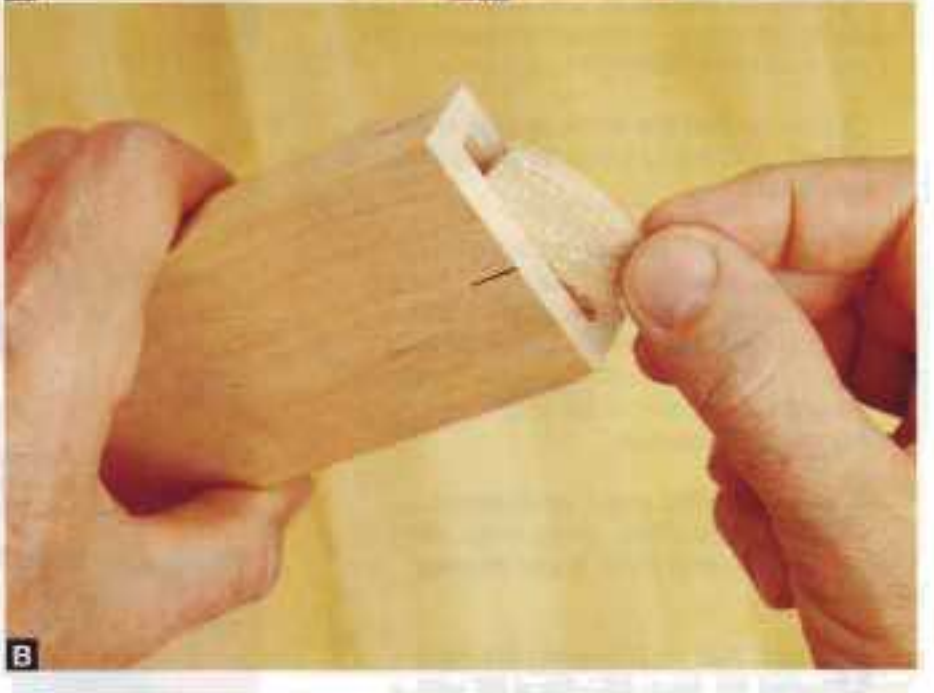
Plunging a workpiece into a standard slot-cutting bit produces a slot that's shorter than a standard biscuit. You can lengthen the slot by moving the workpiece and making additional cuts. However, if you're going to make only a few joints, it's quicker and easier to shorten the biscuits. Here's how to cut slots for a rail-and-stile frame.

Use a steel rule to align the face of your router table fence with the front of the bit's pilot bearing. Place a piece of masking tape on the fence above the bit. Then, use a square and a pencil to mark the center of the bit on the tape. Now, mark the center of a rail. Hold the length of the rail against your miter gauge, equipped with an auxiliary fence that nearly touches the router table fence, as shown in **Photo A**. Align the two center marks, and clamp a stopblock to the router table fence so it meets the back of the miter-gauge fence. Using the miter-gauge fence as a support, plunge the workpiece squarely into the bit. Cut until it contacts the bearing.

Mark a biscuit at both ends, making it slightly less than the slot length. Slice off the ends with a handsaw. Test the fit, as shown in **Photo B**, to make sure that at least half of the biscuit's width slides into the slot.

A

C


B

To cut a matching slot on a stile, leave the miter gauge and stopblock in place. Carefully push the workpiece into the cutter, as shown in **Photo C**.

You can cut a slot in the other end of the stile with the same setup, but you have to flip the stock over, placing the face side down. If the slots are perfectly centered in the stock's thickness, that will work fine. The alternative is to measure the distance from the center of the bit to the miter gauge, then clamp a stopblock at that same distance to the left of the bit. Remove the miter gauge and right-hand stop, then cut a slot at the opposite end of the stile, still keeping the face side up.

STEP A: Your miter gauge, backed by a stopblock, provides a solid, square guide as you push the end of a rail into the spinning slot-cutting bit.

STEP B: Trim the biscuit, slip it into the slot, then test the fit before gluing. If a gap shows, take just a bit more material off each end of the biscuit.

STEP C: Your setup remains the same when you cut a biscuit slot for a stile. This slot will perfectly match the slot in the previously milled rail.

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Small-part safety

When routing small parts, it pays to employ the tricks shown in the photos at *right* to keep yourself safe while making quality cuts. For more guidelines, check out the "Rules of Thumb" *below*—so you can keep yours.

Routing Rules of Thumb

1 Always wear eye and ear protection while routing. Always.

2 Keep all bits clean and in good working condition—poorly maintained bits are accidents waiting to happen.

3 Ensure that the workpiece is solid and free of splits or knots in areas that will be routed.

4 Plan so that your direction of feed moves against the rotation of the bit—this guarantees that the bit's thrust will pull the part against the fence, not push it away and send it flying. As a reminder, mark a curved arrow on your table showing the bit's rotation.

5 When routing small workpieces, avoid, if possible, using large bits—their size and force could destroy the parts.

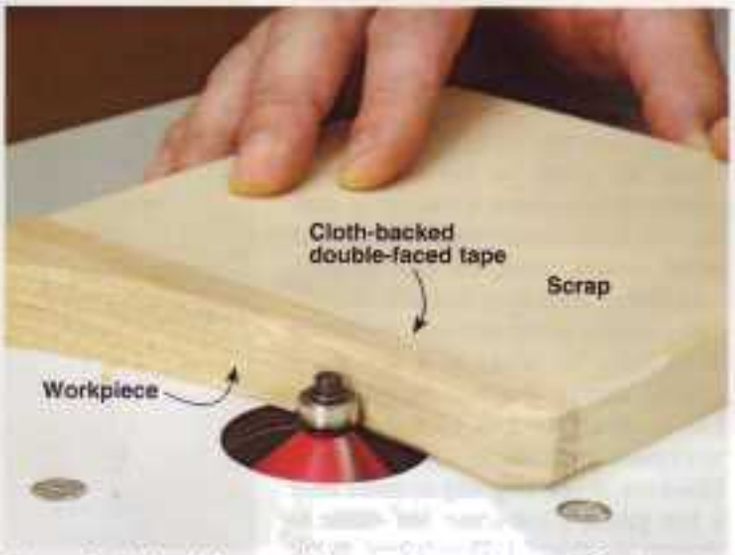
6 Check that you're using the right speed for each bit—for a bit with a diameter of 1" or less, keep the speed below 24,000 rpm. For 1"–2" bits, keep the speed under 18,000 rpm.

7 Make your cuts in small increments (called "skinning") to help maintain control of the part. Try ⅛" as a rule.

8 Use a zero-clearance router base plate or table insert to prevent the small piece from tipping into the hole surrounding the bit.

9 Finally, rely on common sense. If it feels wrong in your gut, don't make the cut.

A wooden handscrew clamp serves as a safe extension of your hands, gripping the small part firmly while sitting flat on the table surface as you rout its edges.



Scrap stock also helps provide you safety and control. Simply apply a strip of double-faced tape to one edge of the scrap, attach the workpiece, and rout. The scrap also assists in preventing chip-out.

For handheld routing of small parts, clamp a scrap to your workbench and apply cloth-backed double-faced tape to the top. Press the small part onto the tape for a secure hold during machining.